AVIATION

The Oldest American Aeronautical Magazine

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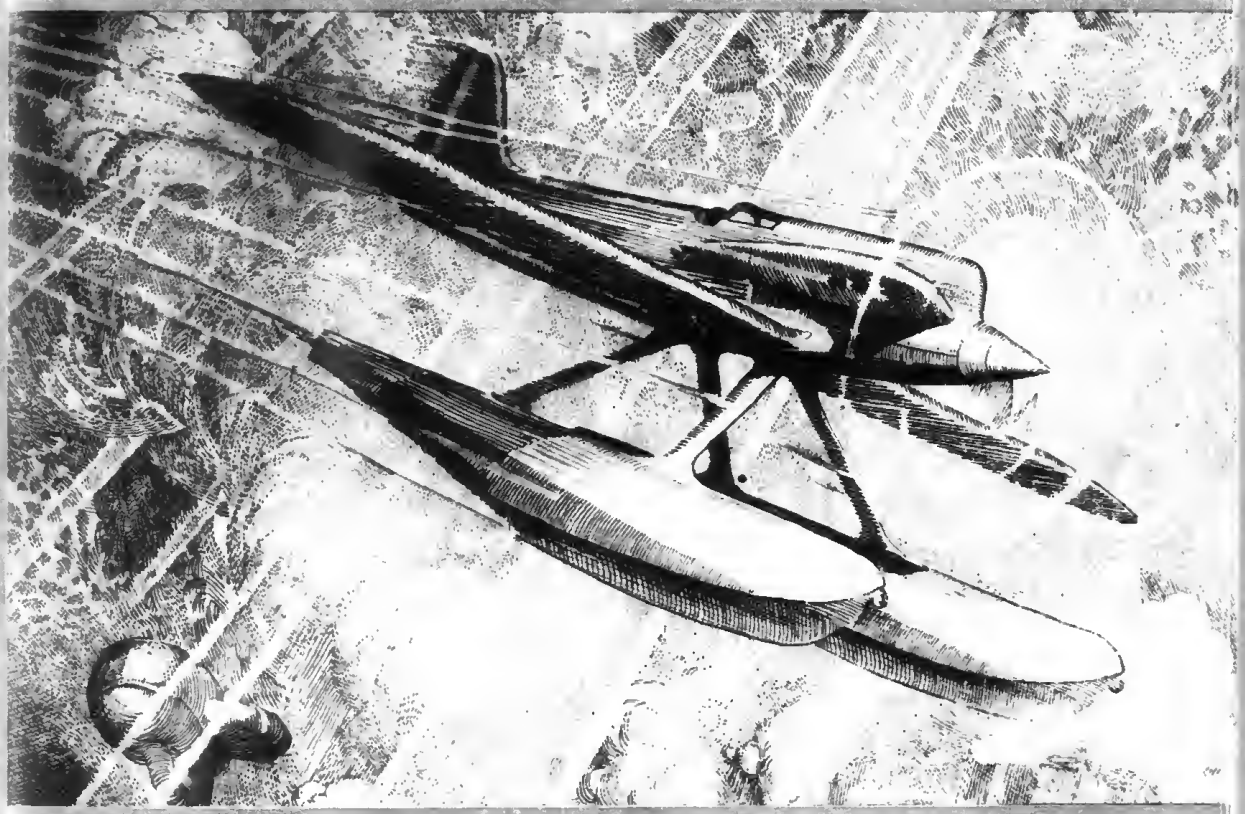

An etching by John MacGilchrist of the Supermarine-Napier S-5 racing plane.

VOLUME XXV NUMBER 26

Special Features

The New Zenith "Z-6"

Barnstorming in a Ford Tri-Motor

Application of "Alclad" to Aircraft

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The Oldest American Aeronautical Magazine

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Vol. XXV December 22, 1928 No. 26

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AVIATION

The Oldest American Aeronautical Magazine

Vol. XXV DECEMBER 22, 1928 No. 26

The Purpose Accomplished

THE paying of international tribute to Wilbur and Orville Wright, and the successful beginning of the task of creating a definite understanding between nations regarding the requisites of world-wide aeronautic progress, might be considered the two paramount accomplishments of the International Civil Aeronautics Conference. In respect to the latter, the outstanding indication of better things to come was the seemingly unanimous approval of an appeal for the unification of the standards of the certificates of aircraft airworthiness issued by the different countries.

The appeal was made by G. J. Desbarats, deputy minister of National Defense of Canada, and chief of the Canadian Delegation, who said in part:

"With the increase in aviation now experienced in all countries, it is very desirable that a much closer agreement should be reached by all countries interested in aviation. This is particularly noticeable in a country situated as is Canada, where, although the factories in the country produce a small number of aircraft, the operating requirements at the present time necessitate the importation of considerable numbers of aircraft and aircraft parts from different countries.

"Canada imports aircraft from Great Britain, the United States, France and Germany, and these craft carry airworthiness certificates issued by the countries of origin. These certificates are based on different requirements, and, as a result, some confusion has arisen. It is very desirable, therefore, that these aircraft and aircraft parts should be built to the same standards as the aircraft actually manufactured in the country.

"I suggest to the members of the Conference that on their return home, they urge on their respective governments the advantage and the necessity of unifying the standards of the certificates of airworthiness issued by the different countries, so that aircraft imported for use abroad could be accepted by the importing country with the assurance that they were built to common standards and to a uniform basis of technical quality."

From the standpoint of the future increase of American aircraft exports, the value to our manufacturers of the adoption of such an arrangement, as outlined by Mr. Desbarats, is self evident. Not having ratified the International Convention for Air Navigation the United States is limited in its exporting of aircraft and aircraft parts to those countries which are not signatories to the Convention, with the exception of Canada which has a working agreement with us, whereby the certificates of one country are recognized by the other. For some time past, efforts have been made to consumate similar reciprocal agreements with certain other countries, but as yet nothing particularly beneficial to the American aircraft manufacturer has resulted.

In view of the fact that the major part of the three days' sessions of the Conference was taken up with the reading, in full or in brief, of over sixty papers covering a variety of subjects connected with the science of flying, the time was insufficient for the full discussion and exchange of views originally intended to be a feature of each of the afternoon sub-sessions. However, it was evident that, while it was the opinion of all the delegates that phenomenal development has taken place in the quarter century of flight, figuratively speaking, the surface of aeronautics has barely been scratched, and that there is much research and consequent improvement to be made in the years to come.

Had there been less reading of papers and more open discussion it is highly probable that the many delegates would return to their respective homes considerably more informed as to the exact nature of the problems existing in other lands, and the lines of action to be pursued in an attempt to arrive at satisfactory solutions. This is particularly true with respect to the representatives of the American aircraft industry who were present. Practically all of them who attended the Conference as spectators and not delegates, were of the opinion before they arrived that the affair was to be a sort of international forum, and when it was discovered that such was not the case their keen disappointment was quite noticeable. There was mention made in several of the papers of problems still unsolved in this country, and elsewhere, but mention only, and no collective expression of ideas and plans for solution. However, that was the only unsatisfactory part of the Conference, and it will undoubtedly be well taken care of in the future.

It could almost be said that the social side of the Conference played as important a part in its success as did the business sessions themselves. At these brilliantly staged functions, the visiting delegates and unofficial representatives of aeronautical organizations in this country and abroad, had splendid opportunities to renew acquaintances, make new ones and exchange experiences and opinions regarding their respective enterprises, etc., all of which quite naturally resulted in a closer bond of friendship and understanding between the aeronautic leaders throughout the world.

In short, the International Civil Aeronautics Conference accomplished the purpose for which it was called and established a precedent in international aeronautic relations. And while many persons took an active part in the arranging of the countless details relative to the holding of the Conference, to three men, Leighton W. Rogers, executive officer, and Osborn S. Watson and A. Pendleton Taliaferro, assistant executive officers, should go the lion's share of praise for the perfect execution of the entire affair. Faced with a task which involved innumerable duties and difficulties they accomplished it in a manner which is not only a credit to their own ability but a credit to the hospitality of the United States Government.

Application of "Alclad" to Aircraft

By E H Dix, Jr

Metallurgist, Research Bureau, Aluminum Company of America

THE successful production, by the Aluminum Company of America, of a new corrosion resistant strong aluminum alloy sheet was announced in May 1927, at the Second Annual Conference of the aircraft manufacturers with the National Advisory Committee for Aeronautics. This product is now an article of commerce under the trademark "Alclad." Alclad sheet consists of a heat-treated strong aluminum alloy base (17ST) protected from corrosion by smooth, dense surface layers of high purity aluminum, alloyed with the core. The thickness of each surface layer is very uniform, it is 5½ per cent of the total thickness of the sheet. A full cross-section of a piece of 20 gauge (0.032 in.) Alclad 17ST sheet is shown in Fig. 1, in which the 17ST core is shown clearly differentiated from the pure aluminum surface by the etching procedure, which has revealed the grain structure of the former without attacking the pure metal.

Alclad sheet owes its superior corrosion resistance to two important facts. The first is that the high purity aluminum surface is inherently highly corrosion resistant and, second, that this pure aluminum exerts an electrolytic protection over the cut edges of the sheet, or other areas where the alloy base is exposed, as for example, in the case of deep scratches or other abraded areas.

Since preparing the first report[1] on the corrosion resistance of Alclad sheet, many other accelerated corrosion tests have been completed, and the results have been even

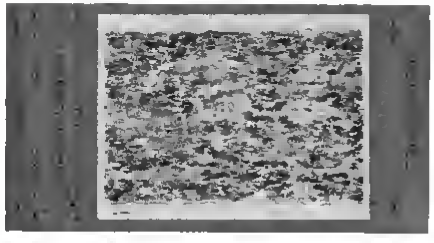


Fig. 1. A micrograph showing the full cross-section of commercial 20 guage (0.032 in.) "Alclad" 17ST sheet. The core and surface layers are shown clearly.

more favorable than was anticipated. In all of these tests, the object has been to compare the effect of a given corrosive condition on Alclad sheet with the effect of this same condition on the duralumin-type sheet. The effect of corrosion has been evaluated by means of tension

[1] "Alclad," a New Corrosion Resistant Aluminum Product, N.A.C.A. Technical Note No. 259

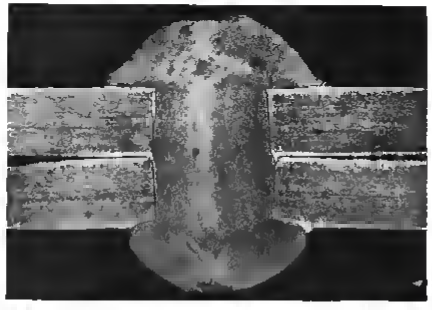


Fig. 2. A micrograph illustrating the electrolytic protection provided by the pure metal coating of a built-up section of 0.081 in. "Alclad" 17ST on the exposed rivets.

tests[2] on the material before and after corrosion, thus enabling any loss in tensile strength, or elongation caused by corrosion to be detected. This, of course, is just the information the aircraft manufacturers need.

Exposure to the continuous spray of a 20 per cent salt water solution has been for some time a favored means of comparing the corrosion resistance of various aluminum alloys. In this laboratory, it has been the practice to test specimens after different periods of exposure such as 1, 4, 8, 12 and rarely, as long as 24 weeks. Such a test on Alclad 17ST sheet had been in progress for a little over 24 weeks at the time of the first report. However, specimens had not been tested at the end of the usual short-time periods because the surface appearance of the Alclad material indicated that no corrosion had taken place. As previously reported, the material had suffered no loss in mechanical properties after 24 weeks, the longest period which had previously been employed for ordinary aluminum alloys. Now, however, the results of tension tests on specimens exposed to the continuous action of the salt spray for one year are available. These and the results of this earlier test are given in Table 1.

From these results it will be seen that the Alclad material has suffered no deterioration in mechanical properties in this accelerated test after a period twice as long as that ordinarily employed in testing the corrosion resistance of normal duralumin-type alloys.

Even such figures as have been given do not serve to

[2] E. Blough, The Evaluation of Corrosion Tests: Proceedings A.S.T.M. Vol. 25, Part II (1925) p. 156

evaluate adequately the corrosion resistance of the Alclad material, for it is not yet known how long a period will be required in this accelerated test to produce an actual deterioration in the mechanical properties of Alclad 17ST sheet. Six months have now elapsed since the one year

Table I.

Tension Tests of Standard Specimens of 14 Gauge (0.064 in.) Alclad 17ST Sheet

Tensile Strength lb. per sq. in.	Elongation per cent in two inches
Original Tests	
56 120	28.2
* After 24 Weeks' Exposure to Salt Spray	
54 510	21.3
** After One Year's Exposure to Salt Spray	
55 860	21.2

Note: These specimens were machined to dimensions (2 x 0.5 in.) prior to corrosion. The spray was from a 20 per cent solution of common table salt.

* Average of two specimens.
** Single test. Two more specimens were left in tank for longer periods.

exposure tests were completed, and a visual examination of specimens remaining in the tank indicates that they are still free from deterioration.

The tests so far discussed have related to 14 gauge sheet (0.064 in.) specimens because this gauge has been standard in our corrosion experiments. Considerations of accuracy in mechanical testing and ease of handling were responsible for the selection of this thickness. However, in the case of Alclad 17ST, it seemed desirable to test also very light gauge sheet. In this way losses in tensile strength and elongation due to corrosion could be obtained in a much shorter time. Accordingly, a greatly accelerated test (alternate immersion in salt-hydrogen peroxide solution) was undertaken on some thin sheet specimens (0.010 in. thick). The thickness of pure aluminum layer (5½ per cent.) was only 0.00055 in., yet, after the standard exposure period of 48 hr., these specimens showed a tensile strength of 51,000 lb. per sq. in. and an elongation of 11.2 per cent. These results are the average tests on 10 specimens cut in the direction of rolling and 10 at right angles to this. Ordinary duralumin sheet specimens of the same gauge, after the same exposure, showed a tensile strength of 27,500 lb. per sq. in. and an elongation of 1.5 per cent.

It would serve no useful purpose to attempt to recount all of the corrosion tests which have been made on this new material, but it will suffice to state that so far some 2,000 specimens have been, or are now being subjected to corrosion. Of all this number, no single instance of low corrosion resistance has been encountered.

The electrolytic protection of exposed areas of the allow base has already been mentioned. An interesting example of this protection is shown by a number of riveted samples in which pieces of 12 gauge (0.081 in.) Alclad 17ST sheet were fastened with ⅛ in. diameter normal (uncoated) 17ST rivets. These samples have been exposed to the action of continuous salt water spray for a period of over 18 mo. Specimens have been taken periodically from these samples and cross sections through the rivets prepared for microscopic examination. The last examination was made after an exposure of 17½ mo. Fig. 2 illustrates the condition of the sample after this period. No evidence of corrosion was found in any of the samples examined. This offers a striking example

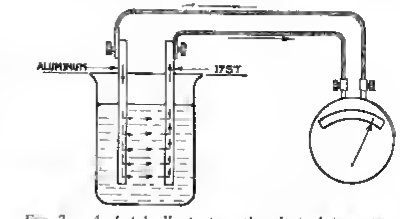


Fig. 3. A sketch illustrating the electrolytic action between pure aluminum and 17ST.

of the extent of the sphere of influence exerted by the pure aluminum surface layer. This type of protection is a common phenomenon, recognized and clearly understood by those versed in electrochemistry.

A simple example will serve to make the principles involved somewhat easier of comprehension. If a piece of high purity aluminum sheet similar to the surface of Alclad sheet, and a piece of 17ST alloy sheet of the same composition as the core, be immersed in a beaker of salt water and these two strips connected through a sensitive voltmeter, it will then be found that a definite voltage is indicated, such that the current would flow in the direction indicated by the arrows in Fig. 3. This means that

(Continued on page 2062)

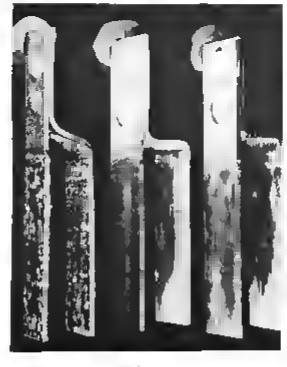


Fig. 4

Fig. 5

Fig. 6

Fig. 4 illustrates the result of the immersion test made with three samples of 0.064 in. sheet ¾ in. wide. Figs. 5 and 6 are micrographs showing the surface conditions, respectively, of the samples shown at the left and center of Fig. 4.

Barnstorming *in a* Ford Tri-Motor

By Fowler W. Barker

A 12 passenger Ford plane, now on a tour of the United States, is doing a considerable amount of good for aviation and at the same time is proving to be profitable to its owners. Leo J. Rocca, a partner in a Washington agency for Ford and Lincoln automobiles, is the organizer of Universal Flyers, Inc., which purchased a tri-engined Ford plane on September 15, and one month later had carried 4,122 pay passengers at five dollars each. What is more important, 90 per cent of the passengers carried had not flown before.

Mr. Rocca has received authorization from the Ford Motor Co. to enlist the aid of its dealers. The great number of dealers throughout the country are naturally anxious to ride in the plane, and in exchange for the opportunity of flying and for the advertising and publicity directed to their businesses by the advent of the Ford plane in their localities, they are invariably receptive to co-operating toward the end that the Universal Flyers' plane has a capacity pay load each time it leaves the ground.

Tour to Last Year and a Half

The plane, which is powered with Wright "Whirlwinds," took off from Hoover Field, Washington, D. C., on October 16 for a nation-wide tour, scheduled to take a year and a half to complete. It will stop at all cities and towns where there are suitable airports for as long as time as business warrants. The winter months are to be spent in Florida.

This barnstorming de luxe, which is quite different from that carried on until recent years by "Jennies" and Standards, has been going on since September 15, when Mr. Rocca accepted delivery of the plane at Detroit. Before reaching his native city, the Ford plane was profitably engaged carrying passengers on 25 mi. sight seeing flights at Lima, Marion, Columbus and Akron, O. Examples of how the extensive tour of this plane will promote the establishment and improvement of airports of the country are illustrated by experiences in Ohio. At Marion, a city of about 35,000 population, an adequate airport was provided within a few days by citizens who were told through the Ford dealers there that the city would not be included in the itinerary unless the existing field was improved. Work was immediately started and the field was conditioned in time for the plane to carry 436 passengers there. Another Ohio city was passed up because of an inadequate airport. However a note was dropped to the effect that when the airport was improved sufficiently the plane would land and take passengers from it. It is anticipated that the personnel of the organization will give talks before civic clubs to further the improvement of airport facilities and the consequent use of airplanes.

There are other examples of assistance rendered to aeronautics by the Universal Flyers, Inc. During the stay at Lima, an influential citizen could not be induced to fly until after his third trip to the airport. Finally he was convinced that it would be safe after a score of his friends stepped from the plane after their first flights.

Pilot Ray Loomis and Charles Wolber, his mechanic, standing beside the Ford monoplane in which they are making a barnstorming tour of the country.

When his first airplane ride was ended, this gentleman was the most enthusiastic patron at Lima.

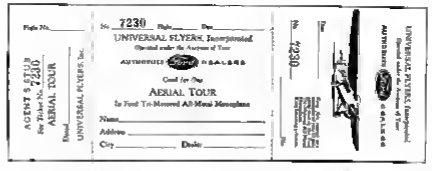
The craft operated from Hoover Field on the outskirts of Washington for two weeks. During that time it carried many prominent passengers, including the Hon. William P. MacCracken, Jr., assistant secretary of commerce for aeronautics. Operation at this field is controlled by the Potomac Flying Service, Inc., which profited by allowing the Ford plane to operate there in that the attendant newspaper publicity, advertising, and the unusual appearance and size of the plane drew a larger crowd than normal. It was strange that Washington, a city quite used to all sorts of flying activity, should have turned out in such large numbers to see the plane fly and to fly in it, if there was room. If the situation in Washington is indicative of what it will be in other cities to be visited, the business during the first month's operation will be surpassed, or at least duplicated, each month during the next year and a half. At Hoover Field the Ford

plane could not carry all the passengers who came to fly in it and the surplus was flown in the Fairchild and Eaglerocks owned by the Potomac Flying Service. There is small doubt that similar situations will exist in other localities where the Ford plane stops, so no difficulty should be encountered in obtaining the use of fields owned or leased by commercial operators. With the advent of the luxurious Ford plane there will be an increase in the "airmindedness" of the community. This will react favorably upon the local operator.

Safety and comfort are stressed in the advertising and newspaper publicity disseminated by Universal Flyers Inc. At all the fields used, a sign is displayed which bears the suggestion, "Fly under the auspices of your Ford dealer." The psychology of this is good, as it denotes conservatism—that flying is no longer the sport of the few, but is for everyone to enjoy. Another use of favorable psychology is evidenced by the fact that the side of the plane bears an up-to-date record of the number of passengers carried.

Mr. Rocca has no advance man. All his preliminary work is carried on by correspondence. He sends out a press story for publication before the arrival of the plane, which quotes a local Ford dealer on the safety of the large plane. During the stay of the plane, releases are given out on the beauties of the community from above and details regarding the Ford plane. The publicity dissemnated also features the personnel. Ray Loomis, formerly pilot on the Chicago-Detroit run of the air freight route operated by the Ford Motor Co., is the pilot for Universal Flyers, Inc. In each city visited, publicity is given regarding his reputation as a pilot, which includes Brooks and Kelly Field training and a year on the Los Angeles-San Francisco air mail route. Press releases are also made available about Mechanic Charles Wolber, regarding the time spent in the Ford-Stout airplane factory and his service at the Ford Airport as a Wright engine mechanic. Publicity received in Ohio mentions that Mr. Wolber spends four hours each day checking and inspecting the big plane before he gives an "O. K." so that it may fly. The advertising also is effective, stressing as it does that the flights are made under the auspices of local dealers, well-known in the city or town.

According to Mr. Rocca, the Ford dealers receive no commission for selling tickets, but obtain benefits indirectly from the publicity and advertising. Further, the tour will educate the dealers aeronautically; it will enable them to become versed regarding this new and important



A reproduction of one of the tickets for a flight in the Ford all-metal monoplane operated by Universal Flyers, Inc.

product of the Stout Metal Airplane Co., Division of the Ford Motor Co. It may not be long before dealers will function as active agents for this product. There is another way in which the dealer profits by the visit of the Universal Flyers' plane. That is that delegations of prominent and influential citizens are invited to make flights as guests of the dealers, which naturally increases the latter's prestige. Universal Flyers, Inc., stands the expense of these guest flights. The Ford company, Mr. Rocca explains, is not financing the trip but has merely sold the plane and will allow him to enroll the assistance of authorized dealers. The dealers, in addition to the aforementioned benefits, will obtain a considerable number of prospective Ford and Lincoln purchasers who come to the salesrooms to purchase flight tickets. After the flight the part of the ticket containing the name and address of the passenger is returned to the dealer responsible for the sale and may be used for purposes of soliciting business in Lincoln and Ford cars. The stub of the

A flight picture of the Ford-Stout, "Whirlwind" powered, monoplane operated by Universal Flyers, Inc.

ticket with autograph of the pilot may be retained by the passenger.

The strictly business aspect of the enterprise cannot be overlooked. During the first month of operation the gross income (figuring 4,000 passengers at $5 each) was $20,000, with an investment of approximately $50,000. A conservative estimate of the cost of operation per hour would be $125, including interest on investment, salaries, insurance, depreciation and in fact all costs. The plane has a seating capacity for 12, but with complimentary rides considered, the average pay load would be 10 passengers a trip, meaning a gross income of $50 for each 15 min. in the air. With the 20 to 25 mi. sight seeing flights consuming 15 min., the gross revenue for each hour of flying time would be $200, thus leaving an approximate profit of $75 each hour that the plane is in use. On the basis of return from expenditures this is an exceptional margin of profit for any line of business. Mr. Rocca can undoubtedly get pay loads between many of the towns from which he operates, although to date he has been flying dealers and their employees between stops, as well as pay passengers.

There is another way aside from the monetary return, by which Mr. Rocca and his associates in the Washington automobile dealership will profit by the tour, and that is the rather unique manner in which he can study automobile conditions throughout the country as they will apply to the Washington car business.

Barnstorming with a transport plane is not new. That carried out by the Sikorsky S-36 which engaged in an itinerant passenger business in New England several years ago was successful. The present venture of Universal Flyers, Inc., has started exceptionally well. It is of importance to note that this activity is not one of an experienced airplane operator, but of an automobile distributor. Was it luck that enabled Mr. Rocca to make a profit from aviation since his entrance into the business? The methods of obtaining business, as outlined in this article, are significant.

The Newark Airport

Newark, N. J., to Have One of the Best Air Terminals in the Country With the Completion of Its Metropolitan Airport

WITH the completion of the Newark Metropolitan Airport next spring, Newark, N. J., it is believed will have one of the most modern and best equipped air terminals in the country, if the plans of the backers for the expansion and development of the field are carried out fully and with the alacrity which has marked the progress made since the construction work was first started.

The site for the Newark airport formerly was nothing but a tract of swamp land east of the city. This marshy sector, long before aviation reached its present stage of development and before the need for air terminals became apparent, was a "thorn in the side" so far as Newark was concerned. In 1907, however, the New Jersey legislature enacted a law allowing the city to purchase the lowlands for purposes of reclamation and development.

In the seven years that followed, the city acquired approximately 2,000 acres at a total cost of about $2,000,000. The work of reclaiming this land has been in progress since that time. In this period also, the north channel was dredged so that Newark might have an inner freight harbor leading into the bay. As a result of these improvements, the value of the land has increased tremendously, and its worth is now variably estimated from $50 000,000 to $75,000,000, in spite of the fact there is still much to be done to the major portion of it.

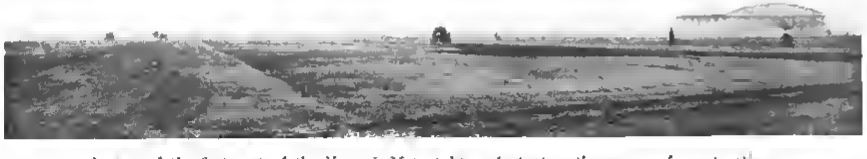
Soon after Colonel Lindbergh's famous trans-Atlantic flight, the construction of an airport on the reclaimed land was advocated, but it was not until last April that the actual work of constructing the Newark airport was commenced. When the city engineers began operations, the site was covered with earth and ash fill. The task of leveling the mounds, filling the depressions, placing two creeks underground, installing a drainage system and constructing roads and bridges for a 600 acre airport is a tremendous undertaking. Yet, in less than seven months, the first unit, consisting of about one-half of the total acreage, was opened.

This unit of the Newark Metropolitan Airport has two wide, crossed runways. These runways are 2,000 ft in length, and down the center of each is a strip of pavement which offers a very smooth surface of landing and taking off, although the remainder of the field may be used for this purpose if it is desired.

The runways and the field are lighted by means of two batteries of high powered floodlights. These floodlight groups, one of which contains 10 and the other 12 lights, are mounted on wooden platforms to the northeast and southwest of the field. In addition, there is a 24 in., 5,000,000 c. p. revolving beacon, which is mounted on a 24 ft tower. This beacon is kept in operation each night from dusk until dawn. The lighting equipment, while adequate for the present needs, is only temporary. The permanent lighting system, it is understood, will cost approximately $50,000. The first unit of the new system, a beacon tower that will carry a 36 in. light, is now under construction.

Loading a Ford monoplane at the Newark airport. Note the ticket sellers booths and the lanes leading to the loading point

Almost every precaution for the protection of planes operating from the field, flying and field personnel, and the passengers and visitors at the airport has been taken. In constructing the Newark terminal, all wiring and cables were placed underground so that the field is practically without obstruction. In addition, all the smokestacks, water towers and tanks in the vicinity are illuminated at night with floodlights or red lamps. In the four corners formed by the crossed runways, the field has been sodded. As a result, an excellent surface is provided for landing. The use of sod was adopted by airport officials, because it was possible by this means to obtain a good stand of grass in a comparatively short time.



A view of the first unit of the Newark Metropolitan Airport in the course of construction

The large crowds that have flocked to the airport since the opening of the first unit last fall are handled very efficiently. To enter the airport grounds, all visitors must pass through the main gate, for a fence has been erected along the roadway. Inside, the crowds are allowed to go as far as the field edge, but an open fence there prevents the spectators from swarming out on the field. Only those, who purchase tickets for flights, are allowed to go beyond the second fence.

Tickets are sold at four booths, which look much like those of bookmakers at a race track. After purchasing a ticket, the passenger enters one of four lanes, which lead to the loading point. An official stands at the outer end of each lane to prevent the passengers from strolling out on the field. When a plane has discharged its passengers, it taxies up to the loading point, and then, only the number of persons which the plane is able to carry are permitted to walk out. It is estimated that 30,000 persons visited the airport on the opening day, and that the crowds have numbered 50,000 every Sunday since that time. Because of the highly efficient system employed, no trouble whatever has been experienced. Large areas devoted to the parking of automobiles have aided materially also.

At present, there is only one hangar at the Newark airport. This is the municipal hangar, which measures 120 ft. on each side. This structure is sufficient size to house from 23 to 25 planes, including two of the large, three engined type. The hangar floor is of crushed rock, tar and sand and offers a firm level base for moving the planes about. The offices of the airport superintendent

Reclaiming the swamp lands to the east of Newark where the metropolitan airport is now located. The pipe lines used in supplying the hydraulic fill are shown

aeronautics engineer and the information department are located on the north side, where two stockrooms and the repair shops also are situated.

A second hangar is soon to be erected by the Standard Oil Company of New Jersey. According to the present plans, this building will be large enough to house from 12 to 14 planes. The Newark Air Service plans also to erect a hangar of approximately the same size. Among the other lessees of hangar space are the Colonial Air Transport and Canadian Colonial Airways. United States Air Transport, Inc., which is operating a daily New York to Washington passenger service, is using the Newark airport as the northern terminus. The transfer of the air mail activities from Hadley Field, N. J., to the Newark field is contemplated in view of the proximity new airport to New York and the metropolitan area. The opening of a hotel and two restaurants is under consideration.

Aside from the commercial aircraft activities scheduled to center there, the Newark Metropolitan Airport will also become headquarters of an aviation division of the

A view of the municipal hangar and the ticket offices of the Newark airport. The crowd shown is typical.

New Jersey National Guard. A 50 yr. lease has been granted the military organization by the Newark City Commission at a yearly rental of $1. One hundred thousand dollars already has been appropriated by the state to begin the work of constructing hangars, administration and other buildings, and it is expected that $150,000 more will be expended. In addition, it is estimated that the federal government will appropriate $30,000 a year as an aid in maintaining the flying establishment. The aviation branch of the 44th Division, New Jersey National Guard, including the 119th Observation Squadron, the 119th Medical Section and the 119th Photographic Section, is the unit that will use the Newark port.

The location of the Newark Metropolitan Airport is highly advantageous. It is across the bay from Manhattan Island, and consequently it takes only a short time to reach it from the general post office, the financial district and other important centers of New York. So far as Newark is concerned, it is only two miles from the city hall. The roads leading to the airport are paved, and bus service to and from Newark is a regular feature. Transportation facilities will be further increased with the completion of the $30,000,000 concrete elevated speed highway, leading into Jersey City and to the Holland Tunnel, which runs under the Hudson and into New York.

The Newark Metropolitan Airport is entirely a municipal project, and it has been supported to the fullest extent by the administration from the mayor of Newark on down. Those who are deserving of especial credit for their work, are the late Mayor Thomas L. Raymond; Jerome T. Congleton, former corporation counsel for the city and the mayor's successor; James W. Costello, chief engineer of Newark; Peter J. O'Toole, Jr., port supervisor; L. D. Coles, assistant chief engineer; Mahlon W. Parsons, Jr., port engineer; Nicholas D'Andrea, assistant engineer in charge of field operations, and Charles S. Dion, the airport manager and the aeronautical engineer for the city.

By virtue of its natural advantages alone, the Newark airport should grow tremendously within the next few years. It is in a position where it can handle the air traffic needs, both land and water, of some 10,000,000 persons, a quarter of them who live in New Jersey.

The New Zenith "Z-6"

A Small Transport Biplane With a Six Place Passenger Cabin in Front and an Open Pilot's Cockpit in the Rear

By Charles F. McReynolds

DESIGNED primarily as a small transport plane, the Zenith "Z-6" seven passenger cabin biplane, under production by the Zenith Aircraft Corp of Santa Ana, Calif., has demonstrated excellent flight characteristics.

In structure the Z-6 conforms with standard practice, having a welded steel tube fuselage and fabric covered wood wings. A large passenger cabin is provided between the wings and immediately in the rear of the engine compartment, while the pilot's cockpit is located behind and above the passenger cabin. The length of the plane overall is 26 ft., 6 in., the span of upper wing is 38 ft., the span of the lower is 36 ft., and the height overall is 10 ft., 6 in. The Wright "Whirlwind" engine is standard equipment, but the Pratt & Whitney "Wasp" engine can be used without structural changes. Albin K. Peterson is the designer of the plane.

The weight of the plane empty is 1,750 lb., the normal pay load is 1,350 lb., and the gross weight loaded is 3,700 lb. Thirty-five hours of flight testing have established the high speed with full load at 112 m.p.h., cruising speed at 90 m.p.h. at 1,550 r.p.m., and landing speed at 40 m.p.h. in still air with a landing run of 585 ft., without using the brakes.

The excellent stability of the plane has been demonstrated by flights made by Pilots V. E. Speich and H. F. Hershey of the Zenith company, and by Robert Day, Department of Commerce aircraft inspector. Many flights have been made "hands-off" under varying load conditions. As many as seven passengers have been carried with ease, in addition to the pilot, and on one occasion the plane climbed to 6,500 ft. in 13 min. carrying five passengers and passing through a 2,000 ft. strata of fog which made instrument flying necessary.

A side view of the new Zenith biplane, showing the passenger cabin and the open pilot's cockpit

The first Z-6 has been shipped to the Bennett Rodebaugh Co. for transport and mail service between Fairbanks, Alaska, and the Yukon. Although it took 30 days to construct the first plane, others of this type are now said to be under production at the rate of two a month.

In appearance the Z-6 is striking. The fuselage, wings and tail surfaces are finished in gold, while the nose cowling, struts, and landing gear are done in blue. Placing the pilot's cockpit to the rear of the cabin gives the plane unusually clean lines, and is said to increase the visability from the pilot's position.

The wing arrangement is that of a single bay biplane with no center section. The two upper panels are rigidly joined at the center, and also to each upper longeron, by fittings at the wing spars. The dihedral of the top wing is zero, while that of the lower wing is 3 deg. There is no sweepback. The chord of the upper wing is six feet, and the chord of the lower wing is five feet. The stagger is 26 in., and the gap 5 ft., 6 in. Incidence of upper wing is 1¼ deg. and that of the lower, 1 deg. The lower wing panels hinge directly to the lower longerons on each side. Interplane struts are of "N" type and customary streamlined wire bracing is employed between wings. The Gottingen 398 airfoil section is used for both upper and lower wings.

A rear quarter view of the new Zenith "Z-6."

All spars are of the box type with spruce caps and plywood plates. Five bays of drag bracing are used in each of the four wing panels with double drag wires. The wire bracing is carried through the beams in every case, permitting ready adjustment and affording a greater brace angle. Compression members are plywood reinforced, heavy ribs. The wing tips are rounded off gradually and carry the true wing curve.

Ribs are of spruce and plywood, and are very light in weight. Those in the upper wing weight eight ounces and in the lower wing seven ounces. They are set six inches apart all the way across both wings, thus materially improving the efficiency of the wing curve. Additional webs are placed along the leading edge between ribs, and the leading edge is then covered with three ply birch plywood top and bottom to a point behind the front spar. Heavy steel cable is used along all trailing edges of the airfoils.

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Student Training

A Discussion of Methods Adopted by the Boston Airport Corp. for Avoiding a Waste of Time in Flight Instruction

By Daniel Rochford

FLYING instruction has often been spoken of as consisting of nine parts of waiting around the airport to one part of flying. The Boston Airport Corp., oldest established operator and flying school in Boston, has graduated hundreds of students since December, 1925, most of whom received instruction on the nine and one basis. Last spring, however, the corporation "washed out" all instruction except for students then completing training.

The whole student training system was analyzed, and the flying school reopened this fall on a new basis. Formerly, the student enrollment ran as high as 175 pupils, ostensibly taking regular instruction. At present the list has some 30 names on it, but all of them are flying regularly and frequently. Two wall charts, or record boards, which any flying school can copy for itself, have played a conspicuous part in the elimination of the wasted time at the airport, and the reduction of the list of students to those seriously interested in completing flight training.

The problem of giving students definite appointments for flight instruction has been faced in many ways by the various schools. Franklin T. Kurt, when chief pilot for Dennison Airport a year ago, telephoned the students the day before their appointments and gave them fixed periods. The B. A. C. tried to do the same sort of thing. However, weather, mechanical difficulties, and the personal friendliness between instructors and students prevented the adoption of any hard and fast system.

Mechanical Problems Solved

Mechanical problems have been solved by having a sufficient number of planes on hand to meet the few occasions when the maintenance force cannot keep everything flying, while the weather is still suffered as of old. However, the personal relations between pilot and student are now definitely limited insofar as they effect student flying appointments. Each student, completing a lesson, may name the hour of his next lesson. This is not subject to cancellation unless the student notifies the corporation 24 hr. ahead of time. If a student fails to keep his appointment, he is charged for it unless the corporation can utilize the time for another student, in which case he is charged merely for the time lost.

Fig. 1 is a sketch of the appointment board. The day is divided into periods of one-half hour each. Seven vertical columns provide for the days of the week, with the half hour rules running across the board horizontally. In the spaces are fixed small screw hooks. Every student has a name card with a staple-ringed hole in it, and on the back of every card is the student's home and business telephone number. A tin rack at the base of the board accommodates the cards when not in use. When the student makes an appointment his card is hung on the proper hook. Inspection and service tags are also placed properly on the time board. Each hook holds a number of cards when several students are to be training at the same time.

By keeping the board "alive" for one week periods only, the tendency is for the student to sign up for time again within the week, whereas he might otherwise wait 10 days or even more. Certain hours being preferred for training, the board is an incentive for all students to sign up early to secure best flying conditions. It serves as a reliable advance notice to pilots not regularly on student instruction of the times when they will probably be needed, and it also lets the corporation know when it can spare pilots for other work.

Student Schedule - BOSTON AIRPORT CORP.

	MON	TUES	WED	THUR	FRI	SAT	SUN
7 00	Armstrong						
7 30	SMITH						
8 00							
8 30							
9 00	JONES						
9 30							
10 00	WILSON						
10 30							
11 00							
11 30	M Hew						
12 00							
12 30							
1 00							
1 30							
2 00							
2 30							
3 00							
3 30							
4 00							
4 30							
5 00							
5 30							
6 00							

Fig. 1. A sketch of the appointment board used by the Boston Airport Corp.

The other chart is the graphic log of student time. This is shown in part in Fig. 2. No method yet devised equals the graphic showing of total flying time of other students to encourage frequent flying. In the past typed

(*Continued on page* 2055)

Pay Wright Brothers Tribute In Pilgrimage to Kitty Hawk

Ceremony Follows International Conference; Harmon Trophy to Lindbergh

WASHINGTON, D C—Last Monday the aeronautical leaders of the world made a pilgrimage to lonely, isolated Kitty Hawk beach, in North Carolina, to celebrate the twenty-fifth anniversary of man's conquest of the air and pay homage to Orville and Wilbur Wright, who, from Kill Devil Hill accomplished the first flight ever made by a heavier-than-air machine The cornerstone of the memorial that will permanently mark the historical spot was laid during the ceremony, and Orville Wright touched it with a trowel Some distance away another monument, a bronze tablet, marking the site of the first airplane fight, was unveiled Secretary of War Dwight W Davis made an address, as did Sen, Hiram W Bingham, president of the N A A, W O, Saunders, president of tha Kill Devil Hill Association, Capt William W Tate, keeper of the Coinjock Light, at whose home the Wright Brothers stayed, Gov Angus W McLean and Rep Lindsay Warren of North Carolina, and Paul E Ackerman Dayton, O

Forty Nations Represented

The ceremony followed the International Civil Aeronautical Conference at Washington, which drew some 125 delegates from 39 foreign countries to undertake the stupendous practical task of obtaining international uniformity of laws and regulations regarding the mounting tide of air travel. The discussions and conferenres developed ideas which are expected to eventoally find their way into the code of international law covering commerrial aviation, and the participants gained a better understanding of some of the general trends of aviation which will be worked out as time goes on.

The conference was opened by President Coolidge's address, in which he reviewed the history of man's efforts to fly from the days of mythology to the present, giving a resume of the development of the past 25 years, told of the dimensions of the foundation laid to support the aviation structure of the future and praised the men who defied the conventional thought of their time to make aviation possible, as well as those who have done so much to further it since that time. A notable featnre of the address was tha fact that many of these pioneers were present to hear it

High tribute was paid to the Wright Brothers by the President who described theirs as "the first extended flight ever made by man in a power-driven machine." Orville Wright was introduced to the conference and received an international ovation

Flying Cross to Wrights

It was announced later that the bill authorizing President Coolidge to present the Distinguished Flying Cross to Orville Wright and to Wilbur Wright, deceased, had been passed by both the House and the Senate and awaited only the President's signature. The President had already been quoted as favoring its passage

The Wright Brothers, and their sister Katherine, who assisted and encouraged them, were the subjects of tribute by Secretary William Whiting In later conferances the brothers wera given scientific recognition and tribute by many aeronautical specialists.

Col. Charles A Lindbergh received the Harmon Trophy, awarded unanimously by the International League of Aviators, for having done the most for aviation in 1927 The award had been voted soon after his New York-to-Paris flight but there had been no previous opportunity to present it. Colonel Lindbergh was escorted to the platform by Orville Wright and the presentation speech was made by M Flandin, vice president of the League and head of the French delegation.

Wednesday afternoon the ronference adjourned at 4 30 P M and the delegates were the guests of President and Mrs Coolidge at a rereption at the White House Later in the evening a reception was held for them by Secretary Whiting

On Thursday morning they met again in plenary session, and in the afternoon separated into small groups for specialized discussion A similar program was followed Friday.

Banquet at Mayflower

Friday evening the foreign delegates and their wives were the guests of the Government at a banquet given at the Mayflower Hotel, and attended by many of the diplomatic and social leaders of Washington. Secretary Whiting was toastmaster, and Sen Hiram Bingham, president of the National Aeronautical Association, and Brig-Gen The Right Honorable Lord Thompson, formerly secretary of State for Air of Great Britain, were the principal speakers.

On Saturday morning the delegates went to Bolling Field where, despite a haze that oftentimes obscured the maneuvers, they were entertained by speed and formation flying by the crack fliers of the Army and Navy In the afternoon a number of the delegates visited the laboratories of the Bureau of Standards and inspected the experiments being carried on with wind tunnels and engines.

At a luncheon in honor of the "Early Birds" aviation pioneers, moving pictures of early flights were shown.

Visit Research Laboratory

Saturday evening the delegates started for Kitty Hawk aboard the Steamer *District of Columbia* On Sunday they disembarked at Old Point Comfort to inspect the research laboratory of the National Advisory Committee for Aeronautics at Langley Firld Returning to the boat they continued to Norfolk to spend the night and Monday morning were conveyed to Kitty Hawk by automobile

It has been announred that bound copies of the speeches read at the conference may be secured from the Superintendent of Research, U. S Government Printing Office, Washington, D C., at $1 00 per copy

Scene at the International Civil Aeronautics Conference showing the presentation of the Harmon Trophy awarded to Col Charles A A Lindbergh by the International League of Aviators Orville Wright stands beside the Colonel

Senator Offers Air Flag Bill

WASHINGTON, D C—A bill to establish an aviation flag of the United States has baan introduced by Senator Shortridge of California

The proposed flag would have a sky-blua fiald, on which would be printed two goldan palm branches with stems crossed, and a larga bronza-colored American eagla with wings extended, a red, white, and blue American shiald on its braast, and holding in its talons an airplana propeller extending horizontally and an oliva branch. Above the eagle's head would be one whita star with fiva points, and below tha propallae would be two stars, one purple and one blue.

The flag would be for appropriata use on all airplanes of the Army, Navy, Marine Corps, and Commerce Department, and on all American-awnad planes

Ask Oklahoma Fuel Tax Refund

OKLAHOMA, OKLA—Thr legislative contart committee of the Oklahoma state chamber of rommerce will recommend to tha next Oklahoma legislature that the tax on gasoline used in airplanes be eliminated or as an alternative that the tax be returned to the airport at which the gasoline was served and the proceeds thus derived are to he used for maintenance of landing field facilities at that field

Maryland Charter for Martin

BALTIMORE, MD—The Glenn L Martin Co has been incorporated in Maryland by Glenn L Martin with a stock valuation of $3 000 000, it is reported here The purpose of the corporation is to experiment with and develop airplanes Warehouse space has been leased from the Canton Company and operations are expected to begin in January.

Youth Completes Prize Solo Trip

CURTISS FIELD, L. I—Richard E Jamas, 17 yr. old Flushing, L I., high school boy who received his pilot's lirense last August, arrived hera Dacembar 15, after having crossed the continent in his Travel Air plana He now standa to receive the $1 000 prize offered by the American Society for the Promotion of Aviation to the first boy under 18 yr of age to complete a transcontinental solo flight with intermediata stops James left San Francisco on October 30, bat he was delayed several times by bad weather

Confer Schiff Trophy On Lieut. James Dyer

WASHINGTON, D C.—Lieut. Jamrs E Dyer of the naval air station at San Diego, Calif., was formally awarded the Herbert Schiff Trophy for safe flying in Navy service during the last fiscal year in ceremonies at the White House, December 15. President Coolidge made the presentation.

In thoroughly safe flying without injury to himself, a passenger, ar plane, Lieutenant Dyer established a record of 1,251 hr, 15 mm. in the air for the year Lieutenant Dyer made a sperial flight to Washington from San Diego to receive the award

Those who won the trophy in the last three years with their total air hours follow 1925, Lieut. Reginald D. Thomas, 536 hr 43 min.; 1926, Capt H Denny Campbell 839 hr. 40 min., and 1927, Lieut Arthur Gavin, 865 hr. The Schiff Trophy was established by tha family of Lieut. Herbert Schiff of New York, who was killed in line of duty at Hampton Roads, Va, in 1924

Missoula Service Organized

MISSOULA, MONT—With arturles of incorporation filed, tha Johnston Flying Service has been organized here to engage in the transport of mail, express and passengers Landing fields are to be purchased and maintained, with Missoula as the principal base, and planes are to be sold, though craft to be offared are as yet unannounced

The conrern is rapitalized at $50,000, with Robert Johnston loral pilot, holding $6 900 in shares Harry Gerard of Butte $7 000

Form Norfolk, Neb., School

OMAHA, NEB—Norfolk Flying School, Inc., has filed artirles of incorporation here, listing capital stock at $10 000. Andrew A Risser and Olga Risser are organizers of the firm

Reserve Space At Detroit Show

Twenty Airplane Manufactures, Thirty-five Accessories Makers Sign

DETROIT MICH—Twenty aircraft manufacturers already have reserved space in Detroit s 1929 aircraft exposition, according to an announrement by Ray Cooper, secretary of the Detroit Board of Commerre Aircraft Bureau Mr. Cooper recently returned from Chicago, where, during the Chicago show, the Aeronautical Chamber of Commerce of American officially sanctioned this city's proposed display

The Detroit show, known last year as the All-American Airrraft Show will be known as the Detroit Amencan Aircraft Exposition, it was said

In addition to the 20 manufacturers of craft, Mr Cooper said, a total of 35 accessory makers have put in bids for space The manufacturers entered to date are The Advance Aircraft Co., Troy, O., Aircraft Development Corp, Detroit, Berliner Airrralt Co, Alexandria Va, Bellanca Aircraft Corp., Wilmington, Del., Buhl Airrraft Co, Marysville, Mich., Butler Aircraft Corp., Kansas City, Mo, Cessna Aircraft Co, Wichita, Kan., Driggs Aircrolt Corp., Lansing, Mirh, Hamilton Metalplane Co., Milwaukee Wis, E M Laird Airplane Co., Chicago Metal Airrraft Corp, Cincinnati, O., Mohawk Aircraft Corp., Minneapolis, Mion., Paramount Airrraft Corp., Saginaw, Mich, Pitcairn Aviation, Inr, Philadelphia, Stearman Aircraft Co. (Flint, Mich, distributor), Wichita, Kan, Stinson Aircraft Corp, Detroit, Stout Metal Airplane Co, Detroit; Swallow Airplane Manufacturing Co, Wichita, Kan, and tha Travel Air Manufacturing Co. Wichita, Kan

Underhill to Construct Travel Air Plant Unit

WICHITA, KAN—Another step in the expansion program of the Travel Air Manufacturing Co was taken recently when the contract for construction of an additional $50,000 unit of the airplane factory was let to the Underhill Construction Co.

The new unit is just south of unit A, which houses the offices. Work of building the new unit started immediately after the contrart was let, as Travel Air employes had leveled off the site before the contractor was known The rontract was let on competitive bids with K K. Shaul, J. H. Turner, and John Engstrom the committee in charge of the deal on behalf of Travel Air.

The new unit is to be 75 to 275 ft It will be connected to unit A, which is connerted to unit B, by a two-story structure 40 by 50 ft. This connecting building will be used as a parts room. Steel and concrete is being used. Unit C will house the engineering offices.

New York Show Lists Exhibitors

Twenty-Seven Organizations Sign for Exposition to be Held in February

NEW YORK, N Y—Aviator's Post No. 743 which is sponsoring the New York Aviation Show to be held at the Grand Central Palace, February 6-13, announces that 27 organizations have already signed, or signified their intentions, to exhibit planes at the show, and that others are being added to the list daily Eighty-two names are included on the list of accessories exhibitors

The plane exhibitors and the craft they will show, as well as the floors upon which their displays may be found, are listed as follows

First Floor—Columbia Airliners, fnc, all metal cruiser and amphibian, Moth Aircraft Co., biplane, Swallow Airplane, biplane, Major George A Vaughn, Jr., Ryan Brougham and Command-Aire, Crescent Aircraft Corp., exhibit; Gates-Day Aircraft Corp., five-place open plane Mill Basin Aircraft Co, Flying boat U S Aircraft Corp, Air-Istocrat; Buhl Aircraft Corp, Airsedan, Hamilton Metal plane Co., metal monoplane, Bourdon Aircraft Corp., Kitty Hawk; Spartan Aircraft Corp, Spartan C-3, Brunner-Winkle Aircraft Corp., Bird biplane, Arthur La Roc, Alexander Eaglerock, Nicholas Beazley Barling low-wing sport plane, Air Associates, Lockheed Vega and Avian

Second Floor—Invincible Aircraft Corp, metal monoplane, Stinson School of Aviation, Thomas D Neelands, Travel Air, Arrow Aircrafts and Motor Corp, two exhibits, Cessna Aircraft Corp., Cessna Transport, New York Aircraft Distributors, Inc, Waco 10, Tidewater Oil Co, Bellanca

Third Floor—U S Army Exhibit C-6 U S Navy Exhibit C-2 3-4 (historical)

The Accessory Displays

The list of accessories exhibitors

First Floor—American Aeronautical Corp., Hamilton Aeronautical Corp. Boyce Moto Meter, Consolidated fnstrument Co, Cirrus Motor Co., Rand McNally & Co., Eaglerock Aircraft Corp, Standard Oil Co., Texas Pacific Coal & Oil Co., Columbia Air Liners, Inc., Moth Aircraft Corp., Heywood Starter Corp, Hamilton Metal-plane Co., Paramount Welded Aluminum, Air Associates, Gates Day Aircraft, Brownback Motor Lab. Inc., Kendall Refining Co., Kinner Motor Corp., Continental Motors Corp, C E Tuttle Interests, National Aero Corp.

Second Floor—Russell Parachute Co, Simplex Wire & Cable Co, Stinson School of Aviation, Guaranteed Aircraft Hangar Co, Invincible Metal Plane Co., Aero Supply Co, General Electric Co., Newark Airport Corp., Aircraft Radio Corp, Austin Hangar Co, Strauss & Buegeleisen, Clarence Whitman, Stewart Hartshorn Co, Shelton Looms, American Bleached Goods Co, Twining Company, Irving Parachute Co., Flents Products Co., Airport Lighting, Deck Distributing Co., Fyre Freez Corp., N Y Washington Air Line, Murphy Varnish Co., Edgar T Ward Co., Tidewater Oil Co

Third Floor—Manhattan Aero Club, Willard Parker Aircraft, K A. Pouch Model Co, American Aviator Publishing Co. Broadfield Toy Co, *Airport Magazine*, Selley Mfg Co, Barrett Airways, *Popular Aviation*, Air Map Co., Oakite Products, Greene Patenia Syndicate, American Society for the Promotion of Aviation, Aviator's Post, Army, U S. Dept. of Commerce, P O Dept., U S Weather Bureau, Mt Carmel Toy Airplane, fdeal Model Airplane, U S Model Airplanes, Gimbel Brothers, Newark Air Service, Spalding, *Popular Aviation*, *Aero Digest*, Henley Publishing Co., N Y Skylines Grotier Society, Folmer Graflex Corp., *Air Transportation*, E H Holmes & Co., *Airway Age*, American Museum of Natural History

Many Contracts For Travel Air

NEW YORK, N Y.—That contracts have been signed and deposits given on more than $2,000,000 worth of Travel Air planes for 1929 is announced here by Doremus & Company, finance house This estimate is taken from reports of 35 of the 116 Travel Air dealers. Work has already been started on a third unit for the Wichita plant, and beginning immediately the entire force will be operated on day and night shifts.

Pioneer Firm Plans Another Factory Unit

BROOKLYN, N Y—Construction of a new building for the Pioneer Instrument Co is to start within a few days according to Charles H. Colvin, president. To be built at a cost of $110,000, the new structure will increase the present floor space for manufacturing equipment by 50 per cent as well as afford increased office facilities

The building will be located on Lexington Avenue directly between the two units now occupied and will be four stories in height New executive offices will be placed in the third floor section with the other floor given to manufacturing

Technical Class at Kansas City

KANSAS CITY, MO.—A school offering aeronautical technical training has been opened here under the name U. S. Aircraft Engineer School Courses in aerodynamics, aero engineering aircraft design, stress analysis, and airport designing are on the curriculum

Production is Started On American Cirrus

BELLEVILLE, N J—Production of the first unit of Cirrus Mark fIf, four cylinder, vertical air cooled engines to be manufactured in the United States has been started The first sub-assemblies for these engines were completed this week in the Belleville factory of American Cirrus Engines, Inc., it has just been announced by Allan C. Hoffman, vice-president of the firm which holds the exclusive American sales, manufacturing and distribution rights for the well known British power plant

The American Cirrus concern, which maintains headquarters at 84 William St., New York, has temporarily leased a factory at Belleville until a site is selected and a permanent factory can be erected The building is a one-story brick structure, containing approximately 35,000 sq. ft of floor space The installation of the machinery and equipment necessary for the production of the American Cirrus engines was started at once, a factory organization was established, and the first steps in the manufacture of these engines were taken.

In AVIATION, the issue for September 1, it was stated that the U S Aircraft Corp of Spokane, Wash., had obtained the license to manufacture the Cirrus engine in the United States This is incorrect American Cirrus Engines, fnc., has the sole manufacturing and merchandising rights in this country.

Gets American Eagle Rights for Five States

NEW ROCHELLE, N Y—Activities of the American Eagle Aircraft Distributors, Inc., formerly of 32 Court Street, Brooklyn, N Y have been taken over by the R & S Motor Corp, 83 Huguenot Street, this city Distribution of American Eagle planes in the states of New York, New Jersey, Pennsylvania, Connecticut, and Florida will continue under the general management of C Robinson, vice president of the R & S firm.

The aviation division of this company, however, will continue operation under the name of American Eagle Aircraft Distributors, Inc. The main office will be at the Huguenot Street address, New Rochelle, while a hangar will be occupied at Curtiss Field, L. I

Record Shipment by N-B

OAKLAND, CALIF.—What is declared to be the largest shipment of airplane supplies ever to be sent to the West, is being delivered to the United States Aircraft Corp at Oakland Airport, according to Charles L. Henck, general manager The lot shipment, comprising more than 2 200 items, was shipped by the Nicholas-Beazley Aircraft Corp, Marshall, Mo. The United Aircraft Corp., which occupies a 20 by 100 ft section in the lean-to adjacent to Hangar 4, represents the Marshall company interests locally.

School and Service Combined at Wichita

WICHITA, KAN.—The Wichita Flying School and Service Co came into being during the past week when the Wichita Flying School, organized four months ago, and the Wichita Air Service Provision Co., in operation seven months, consolidated

Dan Sauder, president of the Southern Kansas Stage lines and an officer of the W. A S. P company, is president of the new corporation Si Dague, who was president of the old Wichita Flying School, is general manager. Charles Lander, with the W A S P. company since its start, remains as manager of field operations Jack Kremel, licensed mechanic, and Joe McKnab, electrical engineer with the old Wichita Flying school, remain with the new organization G Hamilton will be in charge of downtown classroom work, R C Luddington will be office manager, George Ashworth has been engaged to lecture on aeronautical commercial law and Harold Faulkner will be sales manager.

Aaron Greenleaf, W E. Titus and Robert Hasty, officers of the old W A S P. company, are stockholders in the new concern.

It is the plan of the company to erect a $25,000 building on the new 640 acre municipal airport, providing space for hangars, school and workshop The site has been selected

The W A S. P. company contributes to the consolidation equipment consisting of a Travel Air monoplane two Travel Air biplanes and a Swallow biplane. Flying instructors are Landers, Ted Moffatt and Preston Kirk, it is announced.

To Command-Aire

Maj J. Carroll Cone, who has been named director of sales for Command-Aire, Inc., Little Rock, Ark A war flier, Major Cone has had 12 yr. of experience and is an aero leader in his state

Robertson Assembling Complete Aero Stock

ST LOUfS, MO—Plans are under way for the Robertson Aircraft Corp to have one of the most complete stock of aeronautical supplies in the country, according to Howard C. Wilcox, purchasing agent The aircraft corporation already has one of the most complete lines of OX 5 engine parts

Orders were recently placed for $75,000 worth of bolts and for 1,500 pairs of exhaust manifolds for OX-5's A new and revised parts catalogue has been sent out to dealers and enquirers throughout the United States and Canada A complete stock of flying equipment which includes helmets goggles and flying suits also has been installed

At the recent aeronautical exposition in Chicago, the Robertson Aircraft booth displayed supplies Offices for the supply department have been built in the new $75 000 hangar on Lambert Field.

Air Firms Merge to Form New $150,000,000 Concern

Consolidation Includes Boeing, Chance Vought, Pratt & Whitney Corporations

NEW YORK, N. Y—Formation of United Air and Transport by the merging this week of the Pratt and Whitney Aircraft Corp, the Chance Vought Corp and the Boeing Airplane and Transport Corp, effects one of the largest consolidations that the industry has known. Through this deal the company that produces the Wasp and Hornet air cooled engines which hold 12 world's records, the company that manufactures the Corsair planes, and the system which transports much of the United States air mail, will become one organization, although the three concerns will continue without change of individual management, personnel or policies

The new corporation, organized as a holding company, will own securities estimated to have a market value in excess of $150,000,000. In addition to owning all of its own common stock, it will own 70 per cent of the stock of Pacific Air Transport. Included on its board of directors are officers of General Motors, Ford, and Standard Oil companies, as well as of various financial firms

Rentschler Named President

Frederick B Rentschler, president of Pratt and Whitney, will be president of the new organization. Chance Vought, president of the Vought company will be vice-president and William E. Boeing, head of the Boeing concern, will be chairman of the board.

The consolidation was effected under the auspices of the National City Bank of New York and the Pacific National Bank of Seattle.

Directors Are Named

The board of directors, in addition to the above mentioned officers and Charles W Deeds, secretary and treasurer, will include the following: Col Edward A. Deeds director of the National City Bank of New York City; Philip G. Johnson, president of Boeing Air Transport and Boeing Airplane Co; Charles F. Kettering vice-president of General Motors Corp; Kenneth R. Kingsbury, president Standard Oil Co. of California, Charles K. Knickerbocker, president the Griffin Wheel Co. Chicago, William B Mayo, of the Stout Metal Airplane Co; George J Mead vice-president and chief engineer of Pratt & Whitney; Gurney E. Newlin of Los Angeles, Gordon S Rentschler assistant to president of National City Bank, Joseph P. Ripley, vice-president of the National City Co; and Orville W Tupper, secretary and treasurer of the Boeing Airplane and Transport Corp

Engineers Form Firm To Construct Airports

ASBURY PARK N J.—A new organization to engage in the planning design, equipment and construction of airports and airways has been launched, to be known as William H. Mallon Co., Inc., air transport engineers, with the following executive personnel Capt William H Mallon, president, Raymond E. Braley, civil and construction engineer, vice-president, and Thomas E. Mallon, electrical engineer, secretary

Capt William H Mallon recently resigned from the army construction service after 12 yrs active duty. He is a member of the Aeronautical Section, Society of Automotive Engineers, The Aeronautical Division, American Society of Mechanical Engineers, and The Aeronautical Chamber of Commerce.

Trmporary offices of the organization will be located at the Municipal Building Asbury Park, N J, until about February 1, after which the executive offices will be moved to New York City.

Car Dealers Plan Show

PEORIA, ILL.—Automobile dealers of this city are planning an aircraft show in conjunction with their annual auto show The exposition will take place early in the new year, probably in February.

Arrange Miami Meet Program

More Than 100 Pilots Have Accepted Invitations to Compete for Prizes

MIAMI, FLA—Plans for Miami's three-day All-American Air Meet Exposition and Municipal Airport dedication are well under way with acceptances from more than 100 pilots in reply to invitations to be present here January 7 and 8 to compete for cash prizes. The air derby will be closely followed by the formal opening of Pan-American passenger and mail service, January 9

Walter W Bruns, managing director of the derby, has forwarded invitations to every licensed pilot in North and South America, asking that they participate in a series of races, exhibitions, and various events to commemorate municipal air developments at the 160 acre tract of land at Le Jeune and Gratigny Roads, given to Miami for use as an airport by Glenn H. Curtiss, pioneer in aviation

Pilots already signifying their intentions of competing, have sent in replies from every state in the Union, from Canada, Central and South American countries, and the Bahamas and West Indies. Where it has been impossible to get fliers from foreign countries, invitations have been sent the ambassadors in Washington, D. C., asking that they be present for this meet.

Trophies and Prizes Abundant

The complete program is as follows 9 30 A M., aerial parade over Miami; 10 to 10 30 A M., 15 mi race for OX-5 class or less, two or three place planes, prizes, first, $200 second, $150, third $100, fourth, $50, and fifth, $25; 10 30 to 11 A M., 15 mi open cockpit 50 hp class or less, prizes, first, $250, second, $200, third, $100, fourth, $75, and fifth, $50; 11 to 11 20 A M., exhibition of service pursuit planes, prizes, trophies; 11 20 to 11 40 A M., 15 mi race for observation planes, prizes, trophies.

11 40 to noon, inspection of planes by visitors and selection of neatest appearing plane, judges to be mayor and city commission, prizes, first, $75, second, $50 and third, $25 in gold; 1 to 1 30 P.M., 15 mi. race for 200 hp or less of cabin planes, prizes, first, $250, second, $200, third, $100, fourth, $75, and fifth $50, 1 30 to 2 P M., balloon bursting contest, prizes, first, $100, second, $75, and third, $50

To Award Liberty Bonds

2 to 2 30 P.M., bomb dropping, prizes, first, $100, second, $75, and third, $50, 2 30 to 3 P M., dead stick landing to a mark prizes first, $100, second, $75, third, $50, fourth $25 and fifth, $15; 3 to 3 30 P M., Army and Navy race, 15 mi., service planes, single seaters, prizes, Liberty Bonds and trophies, 3 30 to 4 P M., exhibition by service pursuit planes, prizes, trophies

4 to 4 30 P M., parachute drops, prizes, first, $75, second, $50, and third, $25; 4 30 P M., public inspection of planes and passenger carrying until dark; 8 P.M., night flying by Pitcairn air mail pilots

Plane coming greatest distance, in event of a tie, prize to be divided evenly, prize, $500

All events are to be repeated the second day and the same prizes are to be given to winners.

Heads A. A. T. A.

Col Paul Henderson, vice-president of both T. A. T and N. A. T, who succeeds Harris M. Hanshue to the presidency of the American Air Transport Association which is composed of 17 air mail, passenger, and express companies

Dearborn Glider Club Fifth in Evans Group

DETROIT, MICH—Dearborn Glider Club, No 3, was organized in Dearborn recently to be affiliated with the Evans Glider Clubs of America, according to an announcement of Edward S Evans, president of the national organization. The club is the second to be formed in the Detroit area, the first being the Albatross Club, No 1, organized by employes of the Aircraft Development Corp.

Three other clubs, in Portland, Ore., San Francisco, and Hammond, Ind., have been formed to affiliate with the E G C of A., Gliders, Inc., recently organized here to produce gliders for the American market, has completed its initial product.

Air Service Gets Travel Airs

MINNEAPOLIS, MINN—Purchase of two new Travel Air training planes for the use of student pilots has been announced by the local branch of Air Service, Inc., here.

Parks to Teach Licensed Pilots

Post-Graduate Courses in Flying and Ground Work Will Start March 1

ST. LOUIS, MO—Inauguration of a post graduate flying course with specialized training in night and "blind" flying and a comprehensive ground school curriculum is announced by Oliver L. Parks, vice president and general manager of Parks Air College, operating at Park Airport in the St. Louis Metropolitan District three miles south of East St. Louis.

The course, Parks announced, is to be opened on March 1 and is open only to licensed limited commercial and transport pilots It is designed to give the finishing training necessary to equip the pilot for all types of flying. Twenty-seven pilots have already signed contracts to take the course, according to Parks.

A total of 50 hours is comprised in the flying curriculum, to be divided as follows night and cloud flying, 17 hr, radio flying, two hours; cross country flying, by instrument exclusively, 21 hr, photographic flying, 10 hr

The ground school curriculum comprises a total of 467½ hr. of classroom work in which students will not only receive advanced training in the usual ground school subjects, but will also get a full course in radio, aerial photography, mapping, sketching, and field and office administration In addition an exhaustive course in navigation will be included.

Sponser Air Veteran Reunion

CHICAGO, ILL.—Aviation Post No. 651 American Legion, Chicago, is sponsoring a reunion of men who saw service in the air forces of the Army, Navy, and Marine Corps during the war The gathering is scheduled for Chicago on Washington's Birthday, February 22, 1929 All those desiring to attend the reunion are asked to write Sidney A Pierson, chairman, No 705 United States National Bank Building, Indiana Harbor, Ind

Fairchild's 1929 Prices Revealed

FARMINGDALE, L. I.—Prices for the 1929 line of Fairchild planes have now been announced. The Model 21, two place open cockpit plane, is put at $4,250; the closed cabin Model 41, with standard equipment and capacity for four passengers, will sell for $8,950; and the Model 71 seven-passenger closed type is marked at $16,900

New Staff Directing Brownback Activity

NEW YORK, N. Y—An entire change in operating personnel of Brownback Motor Laboratories, Inc., Graybar Building, this city is announced. The firm is the maker of the Brownback radial engine

Officers are announced as follows C. H Phelps, president, H L Brownback, vice-president, and A W Rinke, secretary-treasurer; Theodore C. Phelps, general manager; B H Davis, assistant general manager in charge of sales; and Abbott A Lane, assistant general manager in charge of production

The company's first production of 600 units of the C400 engine, a six cylinder double row radial of 4 13 bore x 5 in. stroke, giving a piston displacement of 397 cu in, has started at the Pottstown, Pa., plant Production of the CS 200, a three cylinder engine of the same dimensions, will follow

Mr. Brownback, who has returned from Europe to take charge of the technical work, has also developed a five cylinder engine developing 150 hp Details of this power plant will be forthcoming later in the winter

Air Corps Promotion Bill Passed by House

WASHINGTON, D. C—The Furlow bill providing for a separate list of Army Air Corps promotions, and designed to prevent "stagnation" in the Corps, has been unanimously passed by the House of Representatives.

Rep. Alvin G Furlow, Republican, Minnesota, author of the bill, told the House that a recent investigation he had made indicated that most of the famous army fliers had forsaken government service for more profitable commercial fields, and called his bill the nearest thing to a separate air department which would take care of the aviator's best interest. Under the bill many army fliers now serving would be promoted immediately and others would be advanced gradually. The bill arranges for promotion only up to the rank of major, after which aviators have the same regulations as other divisions

The measure was attached to a Senate army bill and passed under a suspension of rules.

Many OX-5 Parts for N-B

MARSHALL, MO.—The Nicholas-Beazley Airplane Co, Inc, this city, is having 6,000 new OX-5 engine pistons and 400 new production OX-5 engine cylinders manufactured The firm recently placed an order for 1000 sets of navigation lights for distribution through the various supply depots of their organization as well as through their many dealer and distributor channels.

Design Improved Type of Compass

WASHINGTON, D. C.—The Aeronautic Instruments Section, Bureau of Standards, has designed what is described as an improved form of the Heyl-Brigga earth-inductor compass, it is announced, and an experimental instrument is reported to be nearing completion The compass is to be installed on a plane at College Park, Md, for service tests.

Gypsy Engine License Acquired by Wright

PATERSON, N J—Confirmation is now given that the Wright Aeronautical Corp, has acquired the license to manufacture in the United States the "Gypsy" engine for light airplanes developed in England by the de Havilland Aircraft Co, Ltd, for use in Moth planes The Gypsy is an air cooled four-cylinder-in-line type of power plant developing 85-100 hp

Announcement by the Wright firm states that the Gypsy engine will not be manufactured at the Paterson plant, but instead a factory will be acquired in the Middle West for the especial production of this model in order that distribution may be facilitated Production is to begin in May, the location of the new plant to be announced later

With the acquisition of this model the Wright corporation completes a full line of power plants for aircraft The Gypsy stands at the other end of the list from the huge 525 hp Cyclone. Between the two comes the new Wright engine series recently announced

Travel Airs Sold in Mexico

WICHITA KAN—Two Travel Air monoplanes of the new Model 6000 transport type have been sold at Mexico City following a demonstration of one of the aircraft at the Mexican capital. Harry Barre, an American of Mexico City, purchased the plans for a proposed Mexican airline He will also be distributor of this airplane The demonstrator plane was piloted across the border by Ira McConnaughey He was accompanied by Alfred Leon, export secretary for the Travel Air Company and an interpreter, and W B Howell, Wichita pilot.

Duke on Mission for P.A.A.

BOSTON, MASS.—Lieut Donald Duke, former commander of the Boston Airport, is enroute to Central America via France Field Canal Zone on a six weeks' leave from the Army air corps, to investigate a commercial connection with Pan American Airways involving an air service between Port Limon, Costa Rica, and San Jose, the capital.

Plan Pittsburgh Show in March

Aero Club Exposition Scheduled To be Held in Motor Square Garden

PITTSBURGH, PA—The tri-state region's first aircraft exposition will be held in Motor Square Garden, Pittsburgh, March 9 to 16, under auspices of the Aero Club of Pittsburgh Depicting the rapid growth of aviation in this section of the country, it will be known as the First Annual Pittsburgh Aircraft Show.

The Pittsburgh show, officials of the Aero Club announce, will bring together a large aggregation of well known pilots, manufacturers, dealers, and officials, as well as prospective buyers. Representative types of commercial airplanes, engines and accessories will be displayed, and exhibitors will come from more than a dozen states

States already represented in the list of exhibitors include Pennsylvania Maryland, New Jersey, New York, Ohio, West Virginia, Illinois, Virginia, Delaware, Kansas and the District of Columbia. Educational and historical displays including exhibits by the Army, Navy, and the Department of Commerce, will be brought here for the show.

To Display Gliders

Gliding, which is fast gaining in popularity throughout the United States, especially in mountainous regions like western Pennsylvania, will be represented at the show by exhibits of the latest types of gliders. Other features of the exposition will include a skeleton airplane showing every phase of aircraft construction, miniature models of aircraft hangars, airports and airplanes, a complete wing-building disply with workers constructing airplane wings in the show booths in view of the visitors to the show, a huge aviation map of the United States showing air mail and commercial air lines, a comprehensive military aircraft display, units stationed in the Pittsburgh district and an exhibit by the Naval Aircraft Factory at Philadelphia, which will include the rubber raft used by Richard E. Byrd and his companions to reach shore when fog forced their transatlantic plane "America" to land in the ocean off the coast of France.

Krimm to be Director

Officers of the Aero Club of Pittsburgh are Robert A. Laedlein, president John P. Morris, Louis T. Barry and Col William Thaw, vice presidents; Halsey R. Bazley, secretary, Edward W Thompson, treasurer, Raymond M Marher, Raymond A Tucker, Col Henry C. Fry, Jr, Frank Dickson and John A. Fife, members of the Board of Governors

Ray Krimm, director of the first annual Philadelphia Aircraft Show last November, will direct the Pittsburgh Show

Trade Tips

—Catalogs and information on beacons are desired by Guaranteed Aircraft Hangar Co., 135 04 101st. Avenue, Richmond Hill, N. Y. A field in Queensborough, N. Y., is being established by the company.

—Endress Motors, Inc., Park Avenue, Plainfield, N. J., with show rooms in both Plainfield and Somerville, N. J., for the Buick automobile, are interested in the agency of a popularly priced plane." The firm announces it will display one of the selected type of airplanes on the showroom floor and that it has a suitable field which will be equipped for flying.

—Tome Aviation Club of Tome School, Port Deposit, Md., plans the purchase of a plane for club use.

—Hangar, lighting, and field equipment catalogs are desired by Yoder-Anderson Motor Co., Inc., Snyder, Tex., as well as sales literature concerning aircraft. The Yoder-Anderson company is establishing an air field and states it will be in the market for these items within 60 days.

—H. L. Shaw, city engineer of Corpus Christi, Tex., is preparing plans for a 50 by 60 ft. hangar.

—Corsicana, Tex., has taken a lease on 75 acres lying two miles north of the city limits and will construct hangars and install airport equipment.

—Bids for the construction of a new hangar unit, to be 78 by 160 ft. in dimensions, will be received immediately after the first of the year by W. G. Fuller, Fort Worth, Tex., airport manager. The city has appropriated $30,000 for additions to the field.

—Montana Airways Co., Great Falls, Mont., of which F. P. Gault is secretary, is having plans prepared for a $3,000 hangar.

—Plans for erection of additional buildings to double the capacity of the present plant are being prepared by the Douglas Aircraft Co., Santa Monica, Calif.

Chili Buys Consolidated

NEW YORK, N. Y.—An order for navigational and recording instruments to equip 34 planes, said to be the largest such foreign military order ever placed in this country, has been received by the Consolidated Instrument Co. from the Chilean Government. The equipment, which includes altimeters, air speed indicators, tachometers and compasses, is to be installed on a fleet of Curtiss Falcons, previous to shipment for use by the Chilean Army Air Service. All calibrations on the instruments are to be in Spanish.

Asks Medal for Hegenberger

WASHINGTON, D. C.—A bill authorizing the President to present, in the name of Congress, a medal of honor to Lieut. Albert F. Hegenberger, Army Air Corps, has been introduced in the House by Representative McCormack of Massachusetts. With Lieut. Lester J. Maitland, Lieutenant Hegenberger flew a Whirlwind powered Fokker Army transport plane from Oakland, Calif., to the Hawaiian Islands, June 28-29, 1927, completing the first flight between these points.

Companies Announce Changes in Personnel

A number of changes in staff personnel have been announced during the past week by various companies, and include the following.

PAUL THOMAS of Philadelphia has resigned his position with Cassat & Co., bankers and brokers, to become assistant to Charles Townsend Ludington, president of Ludington Philadelphia Flying Service, Inc., and is in charge of the construction details of the Central Airport at Camden.

EDDIE MERRITT, formerly with the Stinson Aircraft Corp., has been appointed manager of the Tanner Air Livery of Los Angeles, newly formed branch of the Tanner Motor Livery, which has Stinson agency rights for Southern California and Arizona. CHARLES TOWN, also a former Stinson worker, has joined the staff, of which R. C. "BILL" WILLIAMS, former chief rigger for Stinson, is mechanic.

STANCEL GILLEY, graduate of the Brooks Flying School and flying circus veteran, and FORREST O'BRIEN, former instructor in the Nicholas Beazley Aircraft School, have joined the faculty of the Robertson School of Aviation at St. Louis.

BEN O. HOWARD, former pilot for Alexandria Aircraft, and BOBBIE JEWELL, who has been with the Southern Airways of Dallas, are now with the Robertson Aircraft Corp., and will pilot the tri-engined planes being used on the St. Louis-Chicago service.

Associated Aircraft Leases More Space

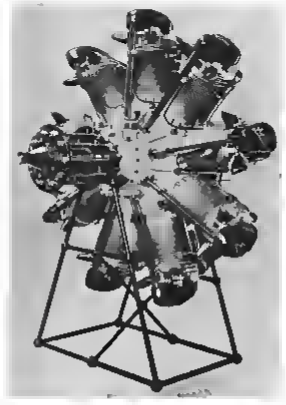
HOLLYWOOD, CALIF.—Because of the rapid growth of the Flying School conducted by Associated Aircraft, Inc., Hollywood, additional school and laboratory space has just been leased at 1611 Cosmo Street, which is to be used for ground school instruction. This building comprises 1,600 sq. ft. and will be equipped with all standard engines and two American Eagle planes for instruction purposes.

New classes in the Rankin System of Flying Instruction will open in the new location shortly.

Bliss Starts Building Jupiter in February

BROOKLYN, N. Y.—Production of Bristol Jupiter radial air cooled engines in the United States is scheduled to start early in February, according to an announcement made recently by Frank Page, president of the E. W. Bliss Company, 53rd St. and 2nd Ave., Brooklyn. The company, which is internationally known as the manufacturer of the Bliss-Leavitt torpedo, has obtained the manufacturing rights in this country from the Bristol Aeroplane Company of England.

The first model engines have arrived from England and production plans are being made with the cooperation of Capt. K. J. G. Bartlett, of the Bristol Company engineering staff. The company is prepared to meet any demand and, as soon as production is underway, 200,000 sq. ft. of the plant will be devoted to this work.



Showing the Bristol Jupiter standard direct drive engine.

Three models are included in the Bristol line and will be manufactured here by the Bliss company. At first production facilities will be devoted to the Jupiter, nine cylinder engine, which will be made in geared, supercharged and direct drive models developing from 440 to 485 hp. Later the seven cylinder Neptune and five cylinder Titan engines will be manufactured. The five, seven and nine cylinders have many interchangeable parts. General Electric magnetos will be used on the American built engine.

Win Flights by Stamp Sales

MISSOULA, MONT. — An airplane trip from Butte to Salt Lake City has been won by two Missoula high school boys. The flight went to the youths for selling the greatest number of air mail stamps in a recent contest. The boys disposed of $64 and $53 worth, respectively.

AIRPORTS AND AIRLINES

Colonial Western Ends First Year

No Injury or Loss Occurred in 165,809 Mi. of Regular Air Service

NEW YORK, N. Y.—Colonial Western Airways, Inc., completed its first year of regular service December 17, according to Sumner Sewall, general traffic manager, having maintained a record over this period free of injury or loss of mail or express matter carried. During the year, the company's planes covered 165,809 mi., though all kinds of weather and partly with night flying, transporting a total of 55,062 lb. of mail and 1,295 passengers.

Consistant growth of the company is shown in a comparison of mail for the first month of operation which totalled 546 lb. with that of November totalling 10,203 lb., an increase of almost 2,000 per cent. The record mail load of the year, 4,452 lb., was carried from Buffalo on November 24, when four planes were used to transport the 188,000 letters it contained to Cleveland and Albany air mail terminals.

Line Extended in June

Colonial Western Airways was organized in May, 1927, and began daily scheduled operation December 17 between Cleveland and Buffalo. On June 1, 1928, the line was extended from Buffalo to Albany where it now connects with the Canadian Colonial planes operating between New York and Montreal.

Fairchild cabin monoplanes powered with Whirlwinds are used for passenger service. For the carriage of mail, Pitcairn Super Mailwings, similarly powered, are used. To meet increased demands during the coming spring and summer, officials plan to add a fleet of tri-engined planes, one of which is already in service.

Reveal Chicago Mail Figures

CHICAGO, ILL.—Operation statistics of mail contractors for the first eight months of 1928 at the Chicago municipal airport have now been made public. According to month, landings, take-offs and pounds of mail, respectively, the figures are as follows:

January, 576, 562, 91,480 lb.; February, 747, 762, 76,648 lb.; March, 1,033, 1,012, 101,408 lb.; April, 995, 1,002, 92,257 lb.; May, 1,610, 1,617, 118,446 lb.; June, 1,612, 1,558, 114,224 lb.; July, 1,690, 1,618, 120,225 lb.; August, 1,605, 1,654, 170,156 lb.; September, 2,627, 2,595, 192,957 lb.; October, 1,805, 1,654, 170,166 lb.

Favor Iowa Tax for Fields

DES MOINES, IA.—The officers and legislative committee of the Iowa League of Municipalities, which met here recently, went on record in favor of a one mill levy for cities of over 50,000 population to provide airports, with a three mill levy for cities between 30,000 and 50,000 and a five mill levy for cities under 30,000. It is expected that the league will draft a bill incorporating these provisions for presentation in the general assembly this winter.

Pitcairn to Establisb Feeder Line to Tampa

TAMPA, FLA.—Establishment of a feeder line from Tampa, which will probably include Orlando and Daytona Beach, has been announced by J. G. Ray, general operations manager for Pitcairn Aviation, Inc. The Pitcairn company is now operating the Atlanta-Miami and Atlanta-New York air mail lines.

Mr. Ray stated that the new Tampa feeder line probably would be inaugurated sometime in February, after lighting of the Atlanta-Jacksonville section of the present Florida route has been completed. Tentative plans called for the line to connect with the Atlanta-Miami line at or near Daytona Beach.

This new line will give Tampa, Orlando, and a number of other important Florida cities overnight air mail service to New York and other large eastern centers.

Ask Omaha Air Commission

OMAHA, NEB.—One hundred Omaha aviation boosters, meeting with the special council committee to recommend plans for the municipal air field, have voted in favor of an ordinance creating an airport commission to act in an advisory capacity and to be a clearing house for suggestions for future air development.

Commissioner Noyes was chairman with Commissioners Hopkins and Dunn as other members of the council committee. Among those who spoke for the commission were Allan A. Tukey and Leo Bozell of the American Legion.

Building Field at Auburn, Me.

AUBURN, ME.—The American Airports Corp. of New England is working on the new Auburn Airport, expected to be ready for flying late next spring. An intensive campaign for funds has been carried on in the city. Carl Keniston of the American Airports Corp. has laid out the field and is in charge of the construction. The project involves $40,000.

November Mails Greatly Heavier

Loads of Four Routes Indicate Increase Over Those Of October

WASHINGTON, D. C.—The volume of air mail carried by the United States Air Mail Service in November, 1928, was almost triple that of November, 1927, and more than eleven times greater than that of November, 1926, according to the report made public by Postmaster General New, which gives figures for the three Novembers, respectively, as 421,174 lb., 141,282 lb., and 37,686 lb.

Only four of the routes, Chicago-Minneapolis, Cleveland-Pittsburgh, Cleveland-Louisville and Albany-Cleveland showed an increase over the previous month of October. The total volume dropped approximately 9.5 per cent. The report explains that November is always a slow month compared to October, due to one less day and the occurrence of a holiday.

Poundage Compared

The following figures represent the poundage carried during the month of October and November, respectively:

Boston-New York, 8,154, 6,993; Chicago-St. Louis, 8,346, 7,089; Chicago-Dallas, 30,750, 25,836; Salt Lake-Los Angeles, 45,015, 44,023; Salt Lake-Pasco, 17,235, 16,545; Seattle-Los Angeles, 16,479, 15,443; Chicago-Minneapolis, 8,780, 8,877; Cleveland-Pittsburgh, 7,304, 12,128, Cheyene-Pueblo, 7,383, 6,753, Cleveland-Louisville, 6,486, 6,885; New York-Chicago, 126,040, 106,150, Chicago-San Francisco, 124,501, 105,254; New York-Atlanta, 19,125, 16,689; Albany-Cleveland, 7,823, 10,225; Dallas-Galveston, 3,481, 3,269; Dallas-Laredo, 7,053, 5,607, Atlanta-New Orleans, 4,495, 4,092, Chicago-Cincinnati, 5,104, 4,910; Great Falls-Salt Lake, 4305, 4,091; Chicago Bay City, 9,563-9,230.

The above figures do not include those for the Chicago-Evansville route, which was established only November 19, and has carried 1,075 lb. since that time.

Add Facilities at Grand Forks

GRAND FORKS, N. D. — An office Building has been constructed on the municipal airport and a new hangar is now under way. Flying conditions have thus far been good, according to John P. Hofstad, local pilot and operator of a Travel Air, for the field froze in the fall immediately after it had been scraped smooth. But a trace of snow has fallen.

Denver to Begin Building at Once

Acquisition of Final 160 Acres Clears Way for Field Improvements

DENVER, COLO —Simultaneously with the closing of the deal December 7 for the final quarter section of ground needed for the new Municipal Airport on Sand Creek, Charles D Vail, manager of parks and improvements, announced that construction of the airport buildings would begin at once. The completion of the transaction, December 7, gives the city clear title to 630 acres costing altogether $143,013.37 This final quarter section has been tied up for 10 yr owing to a provison in the will of the former owner who demanded that the land be held in the estate for that length of time

With $31,986 remaining on hand after the ground had been purchased, the city will proceed to construct some of the foundations for the airport buildings. Next year the city will have $175,000 for building construction and by the end of the year it is anticipated that most of the contemplated improvementa and buildings will have been completed.

The plans for hangars have been changed from those drawn by the original architect, to three times the usual size in order to accommodate planes with 110 ft. spans and the Public Service Co. is now working out the plans for the lighting system

Two companies already have signified intention of using the new field.

L. & H. Plans Georgia Service

HARTFORD, CONN.—The L & H. Aircraft Co. has recently completed arrangements whereby they will operate a passenger and student training service in Georgia The Forest Hills-Ricker Hotel is situated near Daniel Field and James W Ricker, owner of the hotel, is a personal friend of Charles Bradford Beach, president of L. & H A Fairchild cabin monoplane will be used for passenger service and a Challenger biplane for instruction.

Lieut. Carl A. Dixon of the L. & H company flew to Augusta to make final arrangements and Lieut Emerson Carpenter of L. & H. will supervise the new branch.

Facilities for Nicholas-Beazley

MARSHALL, MO.—Facilities that will make possibly complete repair, service, and overhauling of planes and engines have been added at the Nicholas-Beazley Airport, three miles south of this city. The airport is operated in connection with the Marshall Flying School and the Nicholas-Beazley Airplane Co, Inc., affiliated organizations is student instruction and aeronautical supplies, respectively

Start Flint Line

Photo Shows Fred A. Jones, pilot for Thompson Aeronautical Corp. taking first bag of mail from W. E. Ross of AC Spark Plug Co. during recent inauguration of service at Flint, Mich

May Augment Weather Service in New York

ALBANY, N Y—Gustave S Lindgren, head of the meteorological bureau here flew to Washington this week to confer with Government officials on the project of Sen J Griswold Webb chairman of the legislative committee for aviation, for augmenting weather service for New York state airways.

Senator Webb's plan calls for the establishment of additional weather observation stations at Little Falls Ticonderoga Plattsburgh, Lake Placid, Watertown, Poughkeepsie Oneonta Elmira, Hornell Jamestown Middletown, and Malone Observations, taken at 9 A M and 1 P M, would be transmitted immediately to Mr Lindgren, who would tabulate them and have them broadcast from WGY and either WJZ or WEAF.

The total cost of the establishment of this service would approximate $50,000, Senator Webb estimates He plans to ask for an appropriation for this amount from the coming session of the legislature

Extend Privileges at Crockett

GALVESTON, TEX.—Extension for a period not to exceed six months has been granted by the Secretary of War, on the license issued to the Texas Air Transport Co, Inc., allowing use of the flying field at Fort Crockett here. The original license was given for use of the airport by mail planes until such time as a municipal or other landing field could be secured by Galveston Establishment of a new field, however, has been delayed

Pitcairn to Start Work at Atlanta

Plans $300,000 Expenditure For Hangar, Airplanes And Equipment

ATLANTA, GA—Expenditure of $300,000 at Candler Field, Atlanta, for a giant hangar, airplanes, and equipment during the first few months of 1929 has been announced by J G Ray, general operations manager for Pitcairn Aviation, Inc.

The new hangar, 120 by 200 ft, will provide more storage space than the combined area of all three hangars now at the field. It will provide space for six Ford planes in addition to shop and office space. The cost of the hangar will be about $50,000 and work on the building will be commenced as soon as a definite location can be arranged

Three Ford 12 passenger planes have been purchased by the Pitcairn company and will be placed in regular scheduled daily service between Atlanta and Greensboro, N. C., after delivery this spring. An extension of the line is planned from Atlanta to Miami through Jacksonville.

Spare engines, plane parts, tools, shop equipment instruments, and other supplies, will run to an investment of approximately $100,000, according to Mr Ray

Form Iowa Company To Operate Airports

BEDFORD, IA.—The Southern Iowa Airways, Inc., has been organized and will be incorporated with $20,000 capital to operate fields in this section of the state and maintain regular flying schedules from Nebraska City on the west to Keokuk on the east and from Lincoln, Neb, to Omaha and serve any point in Iowa.

Student instruction, passenger service, advertising, express, sales, and repair departments will be organized and officials are planning purchase of more planes to provide complete equipment of the various fields operated. Earl Downing, Clarinda, is president; Leo Caskey, Lenox, vice president, Paul S Cobel, Bedford, secretary-treasurer These men with Paul D Anderson, Mt Ayr, and Clem Shaw, Bedford, comprise the board of directors Jack Beitman, who has been pilot at the Bedford field, will be chief pilot of the new company.

Peoria Has Field Option

PEORIA, fLL.—An option on a 160 acre tract of land, lying one-half mile from the city, has been secured here by the Association of Commerce. The site, it is said, will lend itself readily to development as a Class A airport. With plans worked out, Peoria's eight year old airport will be moved.

Body Meeting to Draft Field Laws in Illinois

DANVfLLE, 1LL.—Representatives of 17 Illinois cities appointed by chambers of commerce of their respective cities, are meeting in Bloomington to draft a bill for presentation to the Illinois general assembly, embodying features which the first state aviation conference held here recently deems necessary for adequate development of municipal airports. Principal goal is to make it possible for cities and towns to secure and maintain airports outside the corporate limits of the city

A special committee, appointed at the Danville meeting, outlined the objects of the first conference and mapped work of the Bloomington session in the following resolution, which was unanimously adopted: "We hereby report that in our opinion additional legislation is necessary, and that it is our opinion that there ought to be a committee of representatives, not exceeding 12, interested in aeronautical matters and that they are to be selected by chambers of commerce in their respective cities to meet in Bloomington for the purpose of formulating suitable legislation . . . ."

It was originally intended to limit the cities in the conference to 12 but this was extended to 17 and the following invited to send delegates to the meeting, Chicago, Decatur, Pekin, Champaign, Danville, Peoria, Kankakee, Bloomington, East St. Louis, Marion, Cairo, Elgin, Rockford Springfield, Streator, Moline and Vandalia.

Montgomery Acquires Large Municipal Field

MONTGOMERY, ALA.—Acquisition of a 805 acre municipal airport by the City of Montgomery is announced by Jesse B. Hearin, manager of the industrial Department, local chamber of commerce

The field, level and well-drained, is but three and one-half miles from the city limits and is bounded on one side by a paved highway and on another by a railway The soil is a sandy gravel that easily grows a Bermuda sod. Planes land and takeoff in all directions, and there are no flying obstructions in three directions.

A large hangar will be erected by the city and the field will be properly lighted It is hoped that formal opening can be made within 90 days

During the past month the United States War Department decided to move the National Aeronautical Tactical School, the only course of its kind in the country, to Montgomery Maxwell Field an observation squadron base, is already located here.

Open Chicago Ticket Office

CHICAGO fLL.—Opening of the Airlines Ticket Office at 103 West Madison Street, this city, on December 19, is announced by Universal Air Lines System and Western Air Express

Appoints Group For Airmarking

WASHINGTON, D C.—Naming of an airmarking committee for the purposes of establishing uniform airway marking throughout the nation, is announced by Secretary of Commerce William F. Whiting. The committee will consist of the following:

Orville Wright, Col. Charles A Lindbergh Henry Ford, Harry F Guggenheim, F. Trubee Davison, W. Irving Glover, Edward P. Warner, William P. MacCracken, Jr., Charles F. Marvin, and Lester D. Gardner

Leases William Penn Field for Three Years

PHILADELPHIA, PA—The William Penn Airport on Roosevelt Boulevard at Red Lion Road, established early this year by the Interstate Flying Corporation, has been purchased by H Wilson Orr, Jr., who has been operating the old Bergdoll flying field at Manoa six miles west of Philadelphia on the West Chester Pike.

The airport's equipment was sold for $21,000 and Orr obtained a three-year lease on the field proper, which comprises 150 acres of grassy surface In taking over the airport, which will be operated under the same name—the Interstate Flying Corporation—Orr also secured the Eastern Pennsylvania dealership for OX-5 Challenger biplanes, which was held by the former owners of the airport. Five Challengers are in service at the field at the present time Orr will be manager of field operations of the new enterprise and has secured the services of George Hand and Arch E. Maddock as pilots

The airport's activities will include the sale of Challenger planes, passenger hops, cross country flights and a flying school The equipment at the field consists of 50 by 60 ft steel hangar, a 15 by 15 ft. office building, three floodlights, a repair shop, and the five Challengers

Hasten Nebraska Airports

OMAHA, NEBR.—The Aurora, Nebr, airport, has been completed and work on the other fields under construction between Lincoln and Grand Island is being hurried as part of a campaign to secure a re-routing of the transcontinental service, which will favor these cities south of the present route

Plan New Eastern Line

PITTSBURG, Pa—Formation of Aircraft and Airways, Inc., capitalized for $100,000, is announced here by Aircraft and Airways of America, Inc., Ryan plane distributor The new firm is to operate air service between Pittsburg and New York and Washington.

Missouri Cities' Bonds Are Valid

Supreme Court Reverses Ruling on St. Louis, Kansas City Issues

KANSAS CITY, MO—The Missouri Supreme Court has reversed its decision of a few weeks ago and now declares the bonds voted for the purchase and improvement of the Kansas City municipal airport valid. The decision also validates the St. Louis airport bonds.

In its first decision the court held the $2,000,000 issue in St. Louis and the $1,000,000 issue here were invalid because no registration of voters was provided prior to the election. A rehearing was asked and argument presented by the two cities that the bond election was held in connection with the regular August primary election and that a registration of voters was provided for this election. The court then reversed its previous finding and, casting aside the technicality gave a "decision of reason" and held the bonds voted by both cities to be valid.

In Kansas City the decision will mean that the municipal airport site will be purchased and improvements rushed as fast as possible. The airport, located within 10 min. of the downtown business district, lies in a bend of the Missouri River across from the city to the north One of the first improvements to be made is a levee along the river to prevent overflow of the field. It is expected the Government will assist in this work Long concrete runways and additional hangars also will be provided.

Night Flights Over Manhattan

NEW YORK, N Y—Night flights over New York City are now being offered by Colonial Air Transport arrangements having been completed by the line for transportation of passengers in Royal Blue Line buses from the McAlpin Hotel, through the Holland Tunnel, to the Newark Municipal Airport

A 50 mi air trip over Manhattan Island in a tri engined Ford plane follows The craft, which accommodates 14 passengers may be chartered by arrangement with the Colonial office at 270 Madison Avenue The tariff is $120, or less than $10 per person, and includes the trip from the hotel to the field and return.

National Airways to Build

PEORIA 1LL.—National Airways System of Lomax, 1ll, has broken ground here for a new factory and airport prior to removal of the company to this city. The firm, which manufactures the Air King and Monofonr planes intends later to produce engines according to Mr. Tannus, president.

FOREIGN ACTIVITIES

Junkers Builds Network in East

Part of Far-Reaching System Is To Be Continued Through Winter

TEHERAN, PERSIA—An air service between this city and Kerman and Bushire via Shirza by the German Junkers company has enjoyed such a good trade that it has been considered feasible to continue it through the winter Consequently the landing field at Shirza has had to be abandoned and a new one established at Petropolis, 30 miles northeast, to provide safety during the wet seasons The stop at Petropolis is expected to be used largely by scientists and tourists, who find much of interest in the ancient city that was once capital of Persia

Brings Persian Capital Near

In collaboration with Ukrwoduchputj Company, of Russia, Junkers is running a weekly service from Teherao to Baku on the Caspian Sea via Pechlewi (450 mi), which line has connection to the daily service from Baku oil fields to Moscow via Machaez Kala, Wladikawkas, Mineralnye Wody, Roston and Charkow (1,900 mi.), operated by the Russian company The German-Russian Dereluft Co. is operating daily services from Moscow to Berlin via Smolensk, Riga, Koenigsberg and Danzig, and Persia's capital can now be reached from all European centers within a few days.

The new Persian line to Kemar is to be the forerunner of through service from Teheron to the State of Afghanistan, in which country, favorable to European methods and institutions, commercial aviation may likewise be exploited by Junkers company Afghanistan will be an important point with regard to through service between Persia and China as well as between Russia and India, the Russian Dobroljot company having already established a weekly service between Kabul, the Afghanistan capital, and Taschkent, in Asiatic Russia, connecting at the latter place with train service to Moscow

Marked Growth Indicated

Traffic reports for the Junkers' regular weekly service established in 1926 and running from Teheren to Pechlewi, 200 mi, Tabriz, 320 mi., and Kasri Shirin, 370 mi., indicate a marked growth during the past year, 2,850 passengers, 83 500 lbs freight and 1,325 lbs of mail being handled

New Record with Gypsy Moth

LONDON, ENGLAND — A new world's speed record for light two-seater planes over a close circuit of 100 kilometers is claimed by the de Havilland Aircraft Co, Ltd., which announces that despite most adverse weather conditions a Gypsy Moth, flown by Allen Butler, chairman of the board of the company, attained a speed of 192.8 kilometers (119.8 mi.) per hour, Mrs Butler as passenger, accompanied her husband on the flight, which was made at the company's Aerodrome at Stag Lane

China's Goodwill Flier Is Greeted at Shanghai

SHANGHAI, CHINA—Flying from South China to North China in an intranational goodwill flight, which is intended to arouse Chinese air consciousness Comdr Chang Hui Chang has reached Shanghai. Upon his arrival here Chang was greeted by Chinese officials and thousands of spectators

With two passengers, the aviator, who received training at Mineola, L. I., recently started from Canton and flew to Nanking, Peking, Mukden, and Tientsin

The flight is also part of a plan to establish air mail routes in China, for which purpose three companies have been formed.

Capetown-to-London Non-Stop Is Planned

LONDON, ENGLAND.—The huge Fairey monoplane, built especially by the air ministry to establish a new world's endurance flight record, will make that attempt in a proposed 6,000 mi non-stop flight between Cape Town, Africa, and England, instead of flying over England for three days and nights as originally planned, it is announced here

The plane, which has a wing span of 90 ft and carries a 530 hp Napier Lion power plant, will start soon for Capetown. Since the craft is too unwieldy to be shipped handily, it will be flown to Capetown by a series of long hops, the first of which will be non-stop to Cairo, Egypt, a distance of 2,100 mi. Squadron Leader A Jones-Williams is to be senior pilot

Romar Defies Waves

BERLIN, GERMANY—Starting and landing of the large Rohrbach Romar flying boat in a rough sea, waves of which are said to have been from 12 to 16 ft in height is reported here Constructors of the plane are said to have expressed satisfaction with the showing of the Romar in these heavy weather service tests

Fairchild Base in Quebec

A combination seaplane and land plane base is found in the airport of Fairchild Aviation, Ltd., at Lac a la Tortue, two and one-half miles east of Grand'Mere, Quebec Permanent runways are indicated in black lines, proposed extentions by dots

MANUFACTURERS' SPECIFICATIONS ON ENGINES AVAILABLE FOR COMMERCIAL USE AS COMPILED BY *AVIATION*

THE TABLE BELOW IS BELIEVED TO BE ACCURATE BUT *AVIATION* DOES NOT ASSUME RESPONSIBILITY FOR THE FIGURES GIVEN

This table will appear monthly and corrections and suggestions are invited

MANUFACTURER OR AGENT	Engine	Cooling System	Cylinder Arrangement	No. of Cylinders	No. of Cycles	Propeller Drive	Rated Hp. and R.P.M. at Sea Level	Maximum Hp. and R.P.M. at Sea Level	Weight Dry Without Hub or Starter	Weight Per Rated Hp.	Bore and Stroke (In.)	Compression Ratio	B.M.E.P.	Displacement (Cu. In.)	Frontal Area (Sq. Ft.)	Diameter of Mounting Ring or Distance Between Bearers (In.)	Height or Overall Diameter (In.)	Length Without Starter (In.)	Guaranteed Fuel Consumption at Rated Hp. Lb./Hp./Hr.	Oil Consumption Lb./Hp./Hr.	Valve Mechanism	Cylinder Construction (See Key)	No. Intake Valves Per Cylinder	No. Exhaust Valves Per Cylinder	Make Spark Plugs Supplied With Engine	Type of Ignition	Make Ignition	No. Carburetors	Make Carburetors	Make Starter	Are Exhaust Manifolds Provided	Shipping Weight Crated	Dept. of Commerce License	Cost at Factory
Aircraft Engine Co	Comet	A	Rad	7	4	D	150-1800														prr	AL S	1	1		4M	Se		Sp,E	Se			N	
Allison Engineering Co.	V1410	A	IV-45°	12	4	D	410-1500	430-1900	1000	2.46	4⅝x7	5.8	128	1410		17	48⅝	78¾	.50	.03	ohc	AL S	1	1	BG	2B	De.	1	Sg'	Ee			Y	
Allison Engineering Co.	VG1410	A	IV-45°	12	4	G	400-1600	430-1500	1125	2.82	4⅝x7	5.8	128	1410		17		88¾	.50	.03	ohc	AL S	1	1	BG	2B	De.	1	Sg'	Ee.			Y	
Allison Engineering Co.	V1650	W	IV-45°	12	4	D	420-1700	450-1600	1025	2.19	5 x7	5.4	122	1650		17	46⅝	74¾	.50	.025	ohc	AL S	1	1	BG	2B	De.	1	Sg	Ee			Y	
Antique Machine Co	Anzani A7R.	A	Rad	7	4	D	150-1900		400	2.67	4⅝x5½	5.0		616			46⅝	65								M	Se	5	Se			100	N	
Curtiss Aeroplane & Motor Co.	OX-5	W	V-90°	8	4	D	90-1400		375	4.17	4x5	4.9		502		12¾			.50	.030	prr	Ma. C.	1	1		1M		1	Z		N		Y	
Curtiss Aeroplane & Motor Co.	OXX6	W	V-90°	8	4	D	110-1600		390	3.55	4¼x5	4.9		568		12¾			.55	.030		Ma. C.	1	1		4M			Z		N		Y	
Curtiss Aeroplane & Motor Co.	C-6A	W	L	6	4	D	130-1700	165-1750	420	2.62	4½x6	5.2	100	572		15¾	30	67⁵⁄₁₆	.56	.015	ohc	AL AL S.	6	6	AC	4M	Su		Z	U	N	665	Y	
Curtiss Aeroplane & Motor Co.	D12	W	V-60°	12	4	D	435-2300	460-2500	680	1.57	4½x6	5.8	165	1145		12¾		50¾	.52	.015	ohc	AL AL S	9	9	BG	2M	Sg	1	Sg	Lo	N	1090	Y	
Curtiss Aeroplane & Motor Co.	Conqueror	W	V-60°	12	4	D	600-2400	635-2450	780	1.30	5⅛x6¼	5.8	130	1900		15¾		58¾	.55	.015	ohc	AL AL S	6	9	BG	1M	Sg	2	Z	Ee	N	1600	Y	
Curtiss Aeroplane & Motor Co. Inc.	Geared Conqueror	W	V-60°	12	4	G²	600-2400	635-2450	850	1.42	5⅛x6¼	5.8	128	1600		15¾		56⅝	.60	.015	ohc	*1 AL S	2	2	BG	1M	Fp	2	Sg	Ee	N	1150	Y	
Curtiss Airplane & Motor Co.	Chieftain	A	H	12	4	D	600-2200	615-2250	900	1.50	5⅝x6⅝	5.8	100	1600		23⅝	45⅝	64⅞	.50	.025	ohc	AL S	2	5	BG	DM	Sc	6	Sg	E	N	1325	Y	
Curtiss Airplane & Motor Co.	Challenger	A	Rad S.	6	4	D	170-1900	185-1800	420	2.47	5⅛x4⅝	5.2	124	603		10	41⅝	35⅞	.55	.020	prr	AL S	1	1	BG	2M	Se	1	Sg	E	N	850	Y	
Dayton Airplane Engine Co.	Bear	A	L	5	4	D	110-1900	100-1900	375	3.41	4⅞x7	5.5	118	444		18	60	42½	.900	.0875	ohc	AL NI	1	1		2M	Sp	1	Z	N	N	820		1600
Fairchild Caminez Eng Corp.	Caminez 447-C	A	Rad	4	4	D	120-1000	140-1000	350	3.05	5⅝x4½	5.0	150	447	6.0	21½	50	65	.50	.000	prr	AL S.	1	1	AC	4M	Se	1	Sg'	Ee	X	775	Y	
Hallet Mfg. Co.	H-526	A	Rad	7	4	D	120-1900		328	3.09	4⅝x5	5.4		526		18½	18	37			prr	C.	1	1	BG	3M	BR	1	Z		N		N	8700
Irwin Aircraft Co.	Irwin 79	A	Rad	4	2	D	20-1700	25-0000	60	3.00	3⅛x2⅝	5.0	110	79	2.0	8½	00	11	.45	.031	As	As, As. S.	1	1	BB	1M	BR	2	WF		N	100	N	625
Kinner Airplane & Motor Corp.	K-5	A	Rad	5	4	D	75-1725	112 1900	262	2.80	4 ⅛x 5	5.0		372		16	42				prr	AL AL S	1	1	CH	2M	Se	1	Sg	B	Y	600	Y	1875
Kimball Aircraft Corp.	Beetle, Model K	A	Rad	7	4	D	18 - 1650		378	3.71	4x5½	7.0	100	385		17	45	37½			prr	AL NI	1	1		6M	Se	1	Sg	Ee				
Menasco Motors Co.	B-2 Salmson	A	Rad	9	4	D	230-1900	270-1700	642	2.66	4 9/16x 6	5.2					16¼	58½	.45	.025	prr	AL S	1	1		2M	O	1	Z					5,200
Michigan Screw Co.	Rover	A	L4	4	4	D	55-1		21'	3.61	3⅛x5	5.0		230							rr	-NI	1	1		2M	Se	1	Sg	N				
Packard Motor Car Co.	1A-2775	W	X-60°	24	4	D	1200-2600	1300-2750	1800	1.16	5⅜x5	7	150	2775	5.95	14⅝	45⅝	76¾	.50	.00	ohc	S	2	2	BG	8B	Se	8	Sg	O	Y		Y	28,000
Packard Motor Car Co.	3A 1500	W	V-60°	12	4	D	800-2500	500-2700	780	1.21	5⅜x5½	5.0	100	1500	4.50	15¾	36⅝	63⅝	.57	.015	ohc	S	6	6	BG	2M	Se	2	Sg	As	N	1675	Y	12,000
Packard Motor Car Co.	5A 1500	W	V-60°	12	4	G	300-2500	350-2700	880	1.46	5⅜x5½	5.5	100	1500	4.50	15¾	38⅝	65	.55	.025	ohc	S	6	6	BG	2B	De.	2	Sg	As.	N	1800	Y	17,750
Packard Motor Car Co.	3A 1500	W	V-60°	12	1	D	600-2500	500-2700	780	1.30	5⅜x5½	5.5	165	1500	4.50	15¾	34⅝	69⅞	.50	.025	ohc	S	2	6	BG	2M	Se	2	Sg	As.	N	1875	Y	18,000
Packard Motor Car Co.	3A 2500	W	V-60°	12	4	D	800-2000	800-2100	1160	1.45	6⅜x6½	5.4	165	2500	6.8	16⅝	35½	69⅝	.50	.015	ohc	S	2	6	BG	2M	Se	2	Sg	As.	N	2150	Y	15,625
Packard Motor Car Co.	3A-2500	W	V-60°	12	4	D	600-2000	635-2100	1280	1.72	6⅜x6½	5.4	133	2500	6.1	16¾	36½	76⅝	.52	.015	ohc	S	2	1	BG	2B	De.	2	Sg	As.	N	2316	Y	19,875
Pratt & Whitney Aircraft Co.	Wasp	A	Rad	9	4	D	400-1900		650	1.62	5¾x5¾	5.2	128	1344		23¾		43⅝	.50	.035	prr	AL S	1	1	BG	2M	Sg	1	Sg		N	1100	Y	
Pratt & Whitney Aircraft Co.	Hornet	A	Rad	9	4	D	500-1900		750	1.37	6⅛x6¾	5.0	123.5	1690		22⅛		44⅝	.50	.035	prr	AL S	1	1	BG	2M	Se	1	Sg		N	1325	Y	
Pratt & Whitney Aircraft Co.	Geared Hornet	A	Rad	9	4	G2	500-1900		82		5 ⅝	5.0	123.5	1691		23⅝		49⅝	.55	0.50	prr	AL S	1	1	BG	2M	Se	1	Sg		N		Y	
Quick Motors Co.	Quick-Radial	A	Rad	9	4	D	125-1800		372	2.9	4 13x5 81	5		687		19⅝	30	66			prr	AL S	1	1	CH	1M	Sc.	1	Z					1700
Siemens & Halske A.G.*	Siemens Sh 13	A	Rad	5	4	D	8 1750		240	3.01	4 13x4 72	5.3		317		14	30⅝	34	.56	.022	prr	AL S	1	1	O	2M	O.	1	Sm.	O.	Y	609	Ex	6,370
Siemens & Halske A.G.*	Siemens Sh 14	A	Rad	7	4	D	115-1750		308	2.68	4 13x4 72	5.3		443		14	30⅝	32	.52	.022	prr	AL S	1	1	O	2M	O.	2	Sm.	O.	Y	725	Ex	6,650
Siemens & Halske A.G.*	Siemens Sh 12	A	Rad	9	1	H	1?0-1?50		382	3.16	3 13x4 72	5.3		517		14 6	40	37	.52	.022	prr	AL S	1	1	O	2M	O.	2	Sm.	O.	Y	800	Ex	2,270
Spartan Aircraft Co.	Walter 5	A	Rad	5	1	D	75-1550		225	3.21	4 13x4 72	4.4	116	317		11 38	37	27 5	.50	.028	oh	AL S.	1	1	AC	2M	Se	1	Sc		Y	600	Y	1,875
Spartan Aircraft Co.	Walter 7	A	Rad	7	4	D	95-1500		320	2.38	4 13x4 72	4.4	100	444		12 6	37	28 5	.40	.028	oh	AL S.	1	1	AC	2M	Se	1	Z		Y	860	Y	2,355
Spartan Aircraft Co.	Walter 9	A	Rad	9	4	D	135 1750		352	2.59	4 13x4 72	4.4	112	572		14 56	30	33 5	.50	.028	oh	AL S.	1	1	AC	2M	Se	1	De		Y	870	Y	2,346
Szekely O. E. Corp.	SR-3	A	Rad	3	4	D	40-1900	45 0-1800	128	3.7	4⅛x4⅝	5.5	100	161	5.0	9½		28¾	.52	.00	prr	C	1	1		M	BR.	1	Z	N	N	205		785
Tips & Smith Inc †	Super-Rhone	A	Rad	9	4	D	120-1350	135-1900	315	2.52	4⅛x5½	5.0		567	4.75	11		99	.61	.000	prr	-, S, C	1	1	Sp	1M	De.	1	Z		N	600	N	2,250
Velie Motors Corp.	Velie M5	A	Rad	5	4	D	65-1750		210	3.00	4¼x5⅜	5.0		250		12⅜	59	37	.55	.025	prr	AL S	1	1	AC	2M	Se	1	Z	Ro.	Y	450	Y	1,550
Warner Aircraft Corp.	Scarab	A	Rad	7	1	D	110 1850	120-1925	270	2.46	4¼x4¼	5.5	112	122		17	56¼	27½	.50	.51	prr	AL S	1	1	AC	2M	Se	1	Sc		N			2,480
Wright Aeronautical Corp.	Whirlwind J6	A	Rad	9	1	D	200-1800	225-2000	500	2.50	4½x5½	5.2	151	788		19½	45	38¾	.65	.035	prr	AL S	1	1	AC	2M	Sg	1	Sg.		N	1100	Y	4,500
Wright Aeronautical Corp.	Cyclone R1750.		Rad	9	4	D	525-1900	550 2000	780	1.52	6⅛x6¾	5.0	150	1753		55⅝	53⅝	40⅝	.50	.035	prr	AL S	1	1	BG	2M	Se	1	Sg		N	1530	Y	

*—Engines of foreign manufacture
†—rebuilt
A—applied for
A—Air cooled
As—Aluminum alloy
As—Aeromarine
Al—Aluminum
AS—Amasis or Scintilla
Au—Automatic
B—Battery ignition
BR—Robert Bosch
Bo—Scintilla booster magneto

C—Cast Iron
Ch—Champion
Cylinder Construction
first—head
second—walls or waterjacket
third—sleeve, if any
D—Direct
De—Delco
Du—Duplex
Dx—Dixie
DM—Dual Magneto
Ee—Eclipse

E—Foreign
Ex—Extra
G—Geared
G¹—3 6 epicyclic gear
G²—6 1 reduction gear
G.E.—General Electric
H—Hexagonal
I—Inverted
L—Cylinders in line
Mo—Monel
M—Magneto
Ni—Nickle Iron

N—No
O—Own
ohc—Overhead cam
prr—Push rods and rocker arms
Rad—Radial
Rad S—Staggered Radial
Sc—Scintilla
Sg—Stromberg
Sg¹—Stromberg NA-U5 duplex
Sg²—Stromberg NAS-8K I

Sm—Sum
So—Solex
Sp—splendorf
S—Steel
U—U.S.L. Electric
V—Vee
W—Water cooled
Wf—Winfield
X—Exide
Y—Yes
Z—Zenith

THE BUYER'S LOG BOOK

Pyle-National Lights

TWO SIZES of landing lights recently have been added to the aeronautical products of the Pyle-National Co., 1334 North Kostner Ave, Chicago, Ill. These lights can be furnished with silver or chromium plated copper reflectors. Both have clean streamline spun aluminum bodies with no projections other than the three mounting lugs. They can also be furnished for built in mounting.

The type LAN-600 is fitted with a six inch reflector and is designed for 10-12 volt, 100 cp., direct current lamp

The type LAN-600 (left) and LAN-1000 (right) landing lights made by the Pyle-National Co.

with prefocused lamp base which eliminates refocusing when making lamp renewals. The type LAN-1000 has a 10 inch reflector and takes a 10-12 volt, 35 ampere lamp with mogul base.

The front goggle door and reflector are arranged as an independent unit and have a ball movement of 20 deg. in all directions. Readings for both horizontal and vertical adjustments of light beam direction are made possible by two sets of graduations marked on the body. A concealed locking device makes the setting permanent. The goggle door is provided with a concealed hinge and a clear convex front glass. Louvers are placed inside of the door to eliminate the light normally outside of the light beam limits.

All joints are closed with impregnated gaskets. Where built in mounting is required both types are furnished with special bodies that permit of universal adjustment.

Protexall Suits

SEVERAL TYPES of aviation suits are offered by the Protexall Company, Abington, Ill. These suits are roomy, comfortable and triple stitched for strength. They are made in regular sizes from 34 to 44 inclusive and three extra sizes, 46, 48, and 50 also are available. Suits may be lettered on the back with firm name or trademark.

The Protexall Aviator's Suit No. 399 is furnished with hookless fasteners down the front and non-rusting snap buttons at neck and wrists. Straps are used at the ankles. Seven pockets are conveniently placed and a close fitting convertible collar is furnished.

Protexall Pilot's Suit No. 299 is similar to the No. 399 with the exception of the breast pockets which are slanting and the bellows knee pockets which are furnished on the No. 299 and not on the No. 399. The only other difference is the snap buttons which are furnished down the front instead of hookless fasteners.

Protexall Ground Suit No. 119 is similar to the No. 399 model but furnished without belt, and ankle and wrist straps. Non rusting snap fasteners are used down the front. All three of these suits are made from special quality white herringbone twill.

Celotex Products

SEVERAL SPECIAL insulating wall board products have been developed for use in aircraft interior finishing and are now offered by the Celotex Company, 645 N. Michigan Ave., Chicago, Ill. The standard products of the company are adaptable to use in hangars and airport buildings.

One of the forms of Celotex intended for use in thermal insulation and sound deadening in cabin planes is 3/8 in. in thickness and can be attached to the steel tube members of a fuselage with small wooden cleats, recessed to accommodate the tubing and glued to the Celotex. A leather interior finish can be obtained by treating the Celotex with pyroxylin lacquer and embossing.

Another form of aircraft Celotex, 1/4 in. in thickness, can be cemented to interior plywood surfaces which constitute the cabin walls and ceiling. This material also may be lacquered and embossed to provide an attractive interior finish. It is also possible to cement this material directly to metal in the case of metal planes.

In cases where upholstery is preferred as an interior cabin finish, Celotex anti-drum can be cemented to the metal or wood interior to reduce vibration. This material is available in thicknesses ranging from 1/16 to 1/8 in. The interior finish is applied over this form of Celotex in any desired manner.

Among the Celotex products adaptable for factory and hangar building are the standard building board, roof insulation board, industrial insulation board, lath, and Acousti Celotex, a sound absorbing material. These products are manufactured in a number of forms of different sizes and thicknesses and provide a convenient and attractive means of interior finishing.

Jaeger Chronograph

THE JAEGER eight-day chronograph, manufactured by the Jaeger Watch Co., Inc., 36 West 46th Street, New York City, is designed for use when rate of climb, speed or acceleration is to be determined in fifths of a second over a predetermined distance. It is used extensively on mail and commercial planes in checking the time passed at various stops and to determine the time required for a given run.

The Jaeger eight-day chronograph

The chronograph hand indicates on the outer scale, which is graduated in fifths of a second, and a window on the dial shows the number of minutes the stop watch hand has operated up to 30 min. and repeating. The inner scale is a conventional watch face. Aluminum cases and 11 jeweled movements are utilized in the manufacturing of this instrument.

Black dials with white figures and hands or silver finish with black figures and hands can be provided. The numerals and hands can be coated with luminous paint, if desired. The weight of the instrument complete is 11 oz.

Tycos Altimeter

ONE OF the recent developments of the Taylor Instrument Companies, Rochester, N. Y., is the No. 1-H-20 Tycos six inch Sensitive Type altimeter. This instrument indicates altitudes up to 20,000 ft. with a minimum of error. The tolerance for hysteresis lag over the whole scale range is less than one-half of one per cent.

Tycos No. 1-H 20 altimeter

The Tycos Sensitive Type altimeter has a stamped sheet aluminum case finished in hard black enamel. The six inch dial is finished in oxidized black with white markings. A fully jeweled movement is provided and carries two hands. The larger hand makes one revolution for every 1,000 ft. and 20 revolutions for the range of 20,000 ft. The smaller hand makes one revolution for the range of 20,000 ft. The dial is divided into 20 foot divisions and figured every 100 ft. making it possible to note changes in altitude of 5 ft. or less. A luminous marking is provided at every 100 foot figure on the large dial and every 1,000 foot division of the smaller dial.

Because of its extreme sensitivity, the instrument is ordinarily used with a static tube to reduce errors due to the relatively lower air pressure in the cockpit of the plane. The larger dial is adjustable by means of a knurled knob to compensate for variation due to barometric changes at the landing field.

The fine readings made possible by the use of this instrument make it adaptable to aerial survey, reconnoissance and photography.

Snap on Ratchet Wrench

A NEW flat ratchet wrench of the Ferret type manufactured by the Snap-on Wrench Co., is now being handled through the Motor Tool Specialty Co., exclusive distributors, which has general offices at 14 East Jackson Blvd., Chicago, Ill., and branches in 26 principal cities. The new model, designated F-7, is 6 in. long or 3 in. shorter than the No. 7 Master ratchet wrench made by the same company.

The new wrench has the same design and finish as the No. 7 and provides a fast and efficient ratchet for use with all Snap-on Ferret sockets including the new flexible types which are considerably smaller than the Master sockets. With these new sockets it is possible to work in small spaces and operate the wrench freely at a 90 deg. angle. They are furnished in 3/8, 7/16, 1/2, 9/16, and 5/8 in. sizes.

S. & B. Goggles

THREE NEW models of goggles have been added to the products of Strauss & Buegeleisen, 30 Front street, Brooklyn. These new goggles, known as the Commander, Major and Pilot, are so designed as to permit of a wide range of vision and correct fit. They were included in the exhibit of the company at the International Aeronautical Exposition in Chicago.

The company has been engaged in the manufacture of goggles for aviators since 1917 and for several years has been using non shatterable Resistal lenses. A number of improvements were made recently in the optical properties of these lenses.

Braden Portable Hangars

A PORTABLE steel hangar which can be used as a permanent building or can be dismantled easily and removed to a different location, has been placed on the market by the Braden Steel Corp., Tulsa, Okla. These hangars are designed to conform with Department of Commerce regulations and are made in different sizes to meet various demands.

Braden all steel hangars are so constructed that it is an easy manner to make additions at either end of the buildings and thus increase the hangar facilities of an airport as the demand increases. These hangars are now being used by airport and air line operators in many parts of the country.

Nonpareil Helmets

NONPAREIL HELMETS, manufactured by the Carson Glove Co., San Rafael, Calif., are now being offered for the use of aviators. These helmets are made of imported India goatskin which is pliable, durable and contain a natural oil which renders the material moisture resistant. Helmets of beaverized lamb and other materials also are manufactured by the company. A number of types in brown and tan with various lining material are available.

Student Training

(*Continued from page 2041*)

total time lists were posted on the bulletin board periodically. But they were a chore to prepare and soon were inaccurate because of changes.

The new chart gives each student's name, the date of every flight, the amount of time he takes each day and his cumulative total, using black ink for dual and red for solo time. It has been found that the customary graphic chart, with merely an inked in line to measure total time after each student's name, does not give sufficient data.

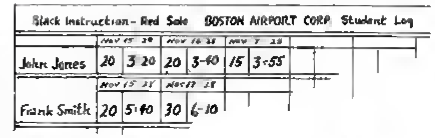


Fig. 2. The "flight log" used by the Boston Airport Corp. to show the hours of instruction and hours of solo flying performed by the students in the flight school

The new chart promotes progressive rivalry, both for time in the air, and for progress in instruction that solo flying may be done.

It is essential that close contact between the instructors out on the field and in the air, and the schedule board, be maintained. A pilot may see that the next half hour is vacant. After he has gone out with his present student, somebody else telephones for an appointment. A flag is used to indicate to him while still in the air not to taxi up to the blocks, because another student is waiting. When he does finish with his present student, the next one is out on the field, ready to climb into the plane.

Pilots of the B. A. C. at present are August Pabst, Naval Reserve aviator, former Harvard Flying Club pilot and now operations manager; Ralph T. Wickford, Army

reserve pilot, graduate of the Army flying schools and chief pilot for the B. A. C, and Adolph Backstrum, wa. flier with the R. F. C., who is the chief instructor. A group of six or seven Army Reserve, National Guard, Naval Reserve, and air mail pilots are employed from time to time as need arises. During the past summer the weekly pilot roll has run from five to seven men regularly

The New Zenith "Z-6"

(*Continued from page 2040*)

Four ailerons are employed and are of wood structure similar to the wings. They are controlled by wires over micarta pulleys to horns on the lower ailerons, while control struts run to each upper aileron. All ailerons are attached to false spars by piano type hinges along the upper edge.

Thurston fabric is used on all surfaces. The wing is protected on the inside with Fuller varnish, and the fabric treated with "Zapon" clear dope and finished with Fuller Bros.' lacquer

Warren type trussing with no wire bracing is used in the welded steel tube fuselage. Spruce fairing is secured directly to the tubing and is covered with fabric, which is treated with Zapon clear dope and finished in Fuller lacquer

The fuselage longerons reduce from 1 in., 18 gauge chrome molybdenum steel tubing to ⅞ in., 18 gauge tubing, the reduction being effected by fish tail welds.

A front view of the new Zenith transport biplane

Fuselage cross members are of 1⅜ in., 20 gauge tubing All fittings on the plane are of laminated chrome molybdenum steel, nickel plated for protection

The passenger cabin is easily entered by doors on the right and left side of the fuselage. Wide plywood walkways with rubber mat covering are provided on each lower wing for use of the passengers in entering or leaving the plane. The two wide doors also make this plane readily adaptable to freight service and the 132 cu. ft cabin makes the carrying of large packages possible. Normal seating arrangement is three passengers on one seat at the rear and three in the forward portion of the cabin. The entire interior is finished in plywood with balsa wood insulation. Chairs are of duralumin construction and are upholstered with leather.

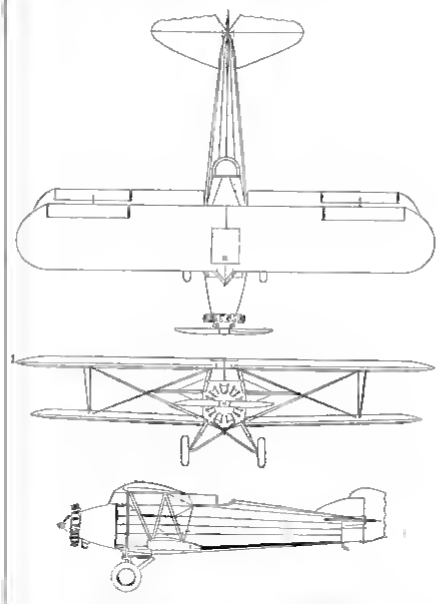
Windows are continuous around the entire cabin, pyralin being used on the sides and safety glass in the front windows. The rear window opens into the pilot's cockpit. This window is of the sliding variety and may be opened for purposes of communication. Baggage space is available to the rear of the passenger cabin and beneath the pilot's cockpit.

The pilot's cockpit is enclosed partially by the cabin structure which acts as a cowling. Visibility is excellent in every direction and the pilot may look directly ahead

through the windows of the passenger cabin. There is provision for but one pilot, and normal stick and rudder bar controls are standard equipment. Consolidated instruments are carried on a burnished duralumin board and include an air speed indicator, turn and bank indicator, oil pressure and temperature gauges, gasoline temperature indicator, which is made necessary by the low temperatures encountered in Alaskan flying, tachometer, standard aircraft compass, light, and engine switches. The throttle is mounted at the left side of cockpit.

Controls to the ailerons are visible for inspection, and control wires to tail surfaces may be readily reached from within the fuselage. Navigation lights operated by "hot shot" batteries are standard equipment.

The power plant is carried on a sturdy detachable mount, which has a reinforced mounting ring. Aluminum cowling is carried around the engine and back as far as



A three-view drawing of the new Zenith "Z-6"

the heavy asbestos lined, duralumin fire wall. Exhaust is carried down and discharged beneath the cabin through bayonet silencers. A Standard Steel propeller is regular equipment, as well as a hand inertia starter for the Whirlwind.

A 10 gal. oil tank is carried in the upper part of the engine compartment. Oil is fed from this tank to the engine through asbestos wrapped, copper tubing. Fuel is carried in two 22½ gal. wing tanks and one 25 gal. tank in the lower part of the fuselage, from which the gasoline is pumped to the upper tank by a wind driven pump.

All tail surfaces are of steel tube construction. The horizontal stabilizer is braced to the fin and fuselage by streamlined wires at the rear edge, and to the stabilizer adjusting mechanism, from the forward edge by streamlined steel tube struts.

Stabilizer adjustment is effected by a ratchet and lever

control in the pilot's cockpit acting through push and pull tubes. Rudder and elevators are wire and horn operated. The rudder alone is balanced.

Landing gear is of the divided axle type with Aerol shock absorber struts extending up to the lower longerons. Bendix wheels and brakes are standard equipment. The tail skid is of the pivoted steel tube type, non-steerable, and employs wrapped shock cord as the shock absorbing medium.

There is ample room for the expansion of the present factory of the Zenith Aircraft Corp., and it is planned at the present time to double the factory space by the first of the year. Every effort will be concentrated for the next year on the production of the Z-6 model in an attempt to reach high quantity production. All fabrication of wings and fuselage is now done on standard jigs.

Zenith Concern a Closed Corporation

The Zenith Aircraft Corp. is a closed corporation and includes Sterling Price, president; Maurice Price, vice-president; John Willingham, secretary-treasurer, and V. E. Speich, chief pilot.

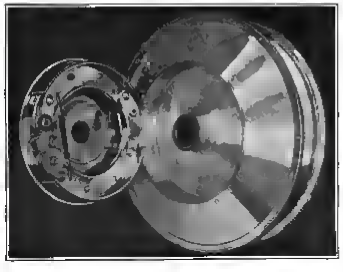
It will be remembered that the Zenith Aircraft Corp. built a large tri-engined plane a little less than a year ago. Although numerous attempts for a new endurance record failed due to engine trouble, a weight lifting record of approximately 35 lb. per hp. was set on two different occasions.

Specifications furnished by the manufacturer are as follows:

Length overall	26 ft., 6 in.
Height overall	10 ft., 6 in.
Airfoil section	Gottingen 398
Span, upper wing	38 ft.
Span, lower wing	36 ft.
Chord, upper wing	6 ft.
Chord, lower wing	5 ft.
Gap	5 ft., 6 in.
Stagger	26 in.
Total wing area	380 sq. ft.
Area of horizontal tail surfaces	40 sq. ft.
Area of rudder	15 sq. ft.
Dihedral, upper wing	0 deg.
Dihedral, lower wing	3 deg.
Incidence, upper wing	1¾ deg.
Incidence, lower wing	1 deg.
Weight empty	1,750 lb.
Pay load	1,300 lb.
Disposable load	1,950 lb.
Total gross weight loaded	3,700 lb.
Power plant. Wright Whirlwind, 200 hp. at 1,800 r.p.m.	
Wing loading	9.73 lb. per sq. ft.
Power loading	18.50 lb. per hp.

Performance:

High speed with full load	112 m.p.h.
Cruising speed	90 m.p.h. at 1,550 r.p.m.
Landing speed in still air	40 m.p.h.
Landing run	585 ft. without brakes
Take-off run with full load	750 ft. or 17½ sec.
Climb at sea level	1,150 ft. per min. empty 750 ft. per min. full load
Climb to 6,500 ft.	13 min. full load
Service ceiling	16,000 ft.
Absolute ceiling	18,000 ft.
Normal gasoline consumption	12 gal. per hr.
Gasoline capacity	70 gal.
Range at cruising speed	600 mi.
Endurance at cruising speed	6-7 hr.
Propeller	Standard Steel
Tires	34 x 6 in. Goodrich



Application of "Alclad" to Aircraft

(*Continued from page* 2035)

the pure aluminum of this little electrolytic cell tends to go into solution and that the 17ST alloy is thus prevented from doing so. The aluminum is said to have the higher "solution potential" or to be "electronegative" to the 17ST alloy. For this reason, wherever pure aluminum and 17ST are in contact in a corroding solution, the 17ST will be protected at the expense of the pure aluminum. This is a very fortunate condition because the high purity aluminum used for the surface layer of Alclad sheet dissolves very slowly in any solution encountered in the normal use of the material and as long as there is any pure aluminum remaining no action can take place in the alloy. Since the strength of the product lies in the alloy core, the aircraft manufacturer is assured the full strength of the structure throughout its life.

Any aircraft manufacturer can easily reproduce the interesting experiment illustrated in Figs. 4 to 6. Fig. 4 shows three samples, each made up of two strips of 14 gauge (0.064 in.) sheet ¾ in. wide, which are riveted together tightly at the upper end. One strip is shown bent so as to separate the two pieces by about 1 in. The sample on the left is composed of two strips of 17ST alloy. The sample on the right is composed of two strips of the high purity aluminum. The sample in the center is composed of one strip of 17ST alloy, which is straight, and one strip of high purity aluminum which has a double bend.

These samples had been immersed for about one week in a six per cent. salt solution containing 10 per cent. by volume of commercial (three per cent.) hydrogen peroxide. The presence of the hydrogen peroxide greatly accelerates the action of the salt water on aluminum and aluminum alloys. Fig. 5 illustrates the surface condition of the strips in the sample made up entirely of 17ST, whereas Fig. 6 shows the condition of the surface of the 17ST in the sample composed of 17ST and high purity aluminum. While in the former case the 17ST was severely attacked, in the latter case it had received less attack than the high purity aluminum strip to which it was riveted. There was very little difference between the corrosion of the high purity aluminum in the sample in which it was riveted to 17ST, and in the sample composed entirely of the high purity aluminum. Microscopic examinations of the 17ST strip which was riveted to the pure aluminum showed that there had been no intergranular attack in the 17ST.

Fig. 7. A pair of seaplane floats covered with "Alclad."

A example of the commercial application of the same principles applying to the Alclad product may be found in the use of zinc to protect iron electrolytically. Zinc bears an electrolytic relationship to iron similar to that which pure aluminum bears to 17ST, and consequently the presence of zinc prevents the corrosion of iron. The use of zinc galvanizing to prevent iron from rusting is

well-known. Also, zinc blocks are fastened to steel hulls of large vessels to prevent the corrosion of the steel

A knowledge of this electrochemical phenomenon helps to explain the reason for the more rapid corrosion of the comparatively recent strong aluminum alloys as compared to the early commercial aluminum. It is, of course, very unfortunate that often such phenomena are not properly understood and taken into consideration in the early use of new materials. When aluminum sheet was first used commercially, it was found to be much more resistant to atmospheric corrosion than iron, or steel and some other metals. This aluminum was at least from 98 to 99 per cent. pure, but was too soft and weak for structural application. The development of the heat-treated strong aluminum alloys of the duralumin type to meet the demand of aircraft construction in regard to mechanical properties, introduced a new factor which has only recently been thoroughly understood. These alloys contain appreciable amounts of other metals, some of which are well removed from aluminum in the electrochemical series and thus accelerate the attack on aluminum.

Recent microscopic studies have given a clue to the explanation of the cause of intergranular corrosion of the heat treated strong aluminum alloys. It seems probable that within the grains of these alloys there exists a

Fig 8 An all "Alclad" 17ST seaplane float under construction by the Hall Aluminum Aircraft Corp.

fine dispersion of sub-microscopic particles of several of the alloying constituents in a matrix of aluminum solid solution, while between the grain there exists a thin film of aluminum solid solution relatively free of precipitated particles. This analysis of a situation which exists beyond the field of resolution of the microscope is drawn from an examination of specimens which have been so treated as to cause the precipitate to coalesce to a size, which is visible under a high power microscope. If this condition does exist, then our experiments regarding the solution potential of aluminum as compared to the alloy would indicate that there is a difference in solution potential between the material composing the grains and that at the grain boundaries, and that the direction of this potential would be such as to cause the solution of the metal at the grain boundaries to be greatly accelerated. The solution of the very small amount of metal in the grain boundaries would proceed rapidly and the corroding solution would be drawn by capillary attraction farther and farther below the surface, following always the films of purer aluminum along the grain boundaries. In this way, the strength and ductility of the alloy would be rapidly destroyed.

The greater tendency of the strong alloys to corrode was not at first recognized, and they were recommended for their strength and hardness, and also an assumed high corrosion resistance, based on experience with the relatively pure metal. When, after considerable use, the susceptibility of the strong alloys to corrode along the grain boundaries (now known as intergranular embrittlement) was discovered, a reaction against the use of thin

sheets of strong aluminum alloys was experienced in some quarters. Had the greater susceptibility of strong alloys to corrode been understood at first, and the proper care taken to protect the surface by suitable paint or varnish, as is now being done, the users of the strong alloys would have avoided many of the pitfalls which have been experienced.

In the case of Alclad 17ST, the surface of pure aluminum is non-porous, of uniform thickness, and alloyed to the core. There is a transition zone between the alloy and the pure metal caused by the diffusion of the soluble constituents of the alloy into the pure metal. This can readily be seen in Fig. 1. Hence there are really three solution potentials to be considered. The pure metal has a higher solution potential than either the diffusion zone

Fig. 9. A Ford plane, owned by the Standard Oil Company of California, in which "Alclad" 17ST sheet was employed for the fuselage and wing covering.

or the alloy, and thus electrolytically protects both. The diffusion zone in turn offers protection to the base alloy. The difference in solution potential between the pure metal and the diffusion zone is probably greater than between the diffusion zone and the alloy, for in severe corroding solutions the pure metal is dissolved from areas surrounding exposed base alloy, and the diffusion zone remains relatively unattacked.

Over the majority of the surface of the sheet, no alloy is exposed, and the accelerating influence of the difference in solution potentials is absent, and the excellent corrosion resistance of the high purity aluminum assures an unlimited life of the surface. The solution of pure metal around the exposed areas of the base alloy has only been observed in very active solutions and probably would never occur in ordinary atmospheres. The continuous action of the salt spray for a period of over 18 mo. has failed to produce any action at the uncoated edge of the specimens.

Going back to the solution of the nearly pure aluminum along the grain boundaries, or the so-called intergranular attack of normal duralumin type alloys, it is clearly seen than the potential relations just discussed afford the most logical explanation for the freedom of Alclad 17ST sheet from this type of attack, for it is an important fact that in all the corrosion tests which have made no evidence of even a trace of intergranular corrosion has been found in any part of the sample.

It will be of interest to recount some of the commercial applications which have been made of Alclad sheet, even though sufficient time has not yet elapsed to draw final conclusions from these applications. The manufacturers of metalclad pontoons, used on seaplanes in service in salt water, have experienced as much difficulty from corrosion of the duralumin type alloys as any other class of user. For this reason they have learned a great deal about means of protection, and it is only natural that they should have been the first to experiment with Alclad sheet. Fig. 7 is a photograph of the first pair of pontoons covered with Alclad 17ST sheet. These pontoons were manufactured by the Metalboat Division of the Fairchild

Airplane Mfg. Corp., and were completed early in September, 1927.

The U. S. Navy is also using Alclad 17ST sheet in several experimental pontoons. Two pontoons, in which the whole structure is of Alclad 17ST, and two composite pontoons, in which the structure is of wood and sheathing of Alclad 17ST, have been built at the Naval Aircraft Factory. The photograph (Fig. 8) shows an all-Alclad 17ST pontoon, under construction by the Hall Aluminum Aircraft Corp.

The Edo Aircraft Corp. has advertised pontoons built of Alclad material as a safeguard against corrosion. These pontoons are anodically treated.

All planes now being constructed by the Hamilton Metalplane Co. are 100 per cent Alclad 17ST, with the exception of tubular members and rivets.

Fig. 9 shows a Ford monoplane, manufactured for the Standard Oil Company of California, in which Alclad

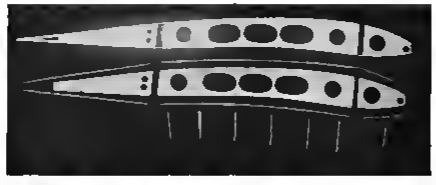


Fig. 10—A Loening wing rib, constructed of "Alclad" 17ST sheet, and used in planes manufactured for the U. S. Army. Ribs of this type previously were treated anodically and were finished with one coat of iron oxide primer and one coat of aluminized spar varnish.

17ST sheet is used for fuselage and wing covering. The use of Alclad 17ST sheet for these surfaces is now standard with Stout Metal Airplane Co., Division of Ford Motor Co.

The Curtiss "Robin," recently described[3], is said to have wing ribs stamped from one piece of Alclad 17ST sheet. Also the new Sikorsky "Amphibion," S-38, according to a recent description[4], has a hull of composite wood and duralumin construction, covered with Alclad 17ST sheet. Fig. 10 shows a wing rib constructed of Alclad 17ST sheet, and manufactured under a U. S. Army contract by the former Loening Aeronautical Engineering Corp., which is now a division of Keystone Aircraft Corp. These ribs were originally made of regular 17ST and were given one coat of aluminized spar varnish dried at about 250 deg. F. It was thought that this did not give adequate protection and the ribs of the airplanes on the next contract were all treated anodically and finished with one coat of iron oxide primer and one coat of aluminized spar varnish. On the last 10 airplanes Alclad 17ST ribs were used, and were finished with one coat of iron oxide primer and one coat of aluminized spar varnish.[5]

A recent description[6] of tests on a new metal amphibian states that "Riveted Alclad duralumin sheets are used in sheathing the hull which is of 'V' bottom, single step design with sponsons."

These examples of the commercial use of Alclad 17ST sheet are given not so much to indicate the extent to which this material is being used in the industry, but rather to show that the results of service tests in a number of locations will soon be available, to indicate the full value of this new product as a material for aircraft construction.

[3] AVIATION, *Vol. XXIV, No. 21 (May 21, 1928)*
[4] AVIATION, *Vol. XXV, No. 4 (July 28, 1928)*
[5] *Private communication from J. B. Johnson, Wright Field*
[6] AVIATION, *Vol. XXV, No. 20 (Nov. 10, 1928)*

SIDE SLIPS

By ROBERT R. OSBORN

We were just beginning to get enthusiastic over the excellent address President Coolidge was making before the recent International Civil Aeronautics Conference, when he came to the part where he said:

"We are making a reality of the wonderful vision of Tennyson, who, in his 'Locksley Hall,' wrote in 1842—

" 'For I dipt into the future, far as human eye could see,
Saw the vision of the world, and all the wonder that would be,
Saw the heavens fill with commerce, argosies of magic sails,
Pilots of the purple twilight, dropping down with costly bales.' "

As this is the twenty-fifth anniversary of flight, it seems to us to be a propitious time to do something about this particular poem. Ever since we first professed an interest in aeronautics and began to admit we might even enter the business, friends of ours by the dozens have disregarded our violent protests that we have heard this particular bit of poetry repeatedly before. They quote it very dramatically and enthusiastically to us, or presenting us with copies of Mr. Tennyson's works, with that section marked for our attention. We think we can safely say, too, that it has been the bane of the existence of nearly everybody else even remotely connected with aeronautics. So, let's all frankly admit that it was wonderful vision on the part of Mr. Tennyson, and give him three rousing cheers, and then permit this quotation to rest quietly until, say, the fiftieth anniversary of flight.

* * *

The fact that aviation enthusiasts are willing to make great sacrifices to do their part in the advancement of the art, was demonstrated to us in a very touching way recently. Deak L. and Leo K., prominent New York newspaper writers on aeronautical subjects, have sent us a letter in which was a clipping describing a new "non-combustible" fuel for airplane engines.

"This fuel will not alone not ignite, but will extinguish gasoline which has ignited," the clipping says. "Experiments were made to determine the point at which this Diesel fuel oil is ignited. Some was placed in an iron ladle and efforts made to set it afire, without success. The oil was then heated over a fire to a high temperature and efforts made to ignite it. It burned only as long as the open flame was in contact with it . . . . When the Diesel oil was thrown on hot engine parts it did not take fire. Instead, it cooled off the engine."

Their letter pointed out that these tests were not sufficient to prove that the new oil was acceptable for use in airplanes. For instance, they wrote, the reaction of this oil when mixed with cracked ice and ginger ale was still to be determined, and they were just starting out to one of the New York night clubs to run such a test. As they have been unreported for nearly a week now, we assume that their test showed either very positive, or very negative results.

* * *

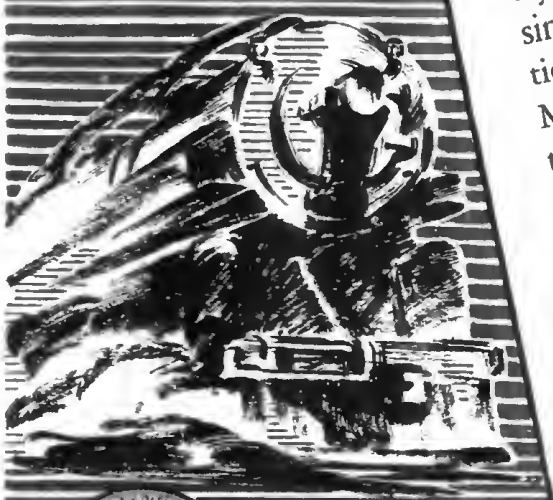
Well, here's wishing you all a very merry Christmas and hoping that Ol' Santa Claus has many happy landings at your place in the years to come.

When the World's Crack Trains are too Slow!

Northwest Airways, Incorporated, in connection with three of the great western railroads, have selected Pratt & Whitney powered equipment to carry on the first air-rail route.

By the use of Ford tri-motor and Hamilton single-engine planes, now in daily operation between Chicago and St. Paul and Minneapolis, a full business day is saved the traveller on his trip to the East or West Coast.

Passengers have the assurance on this line that the Pratt & Whitney engines behind which they ride embody the finest in modern design and workmanship — engines with an international reputation for dependability.



THE
PRATT & WHITNEY AIRCRAFT CO.
HARTFORD CONNECTICUT